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RECREATIONAL ANGLER SURVEYS: THEIR ROLE AND IMPORTANCE NATIONAL AND THE 2008 MICHIGAN ANGLER SURVEY

By

Jody Christopher Simoes

A THESIS

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

MASTERS OF SCIENCE

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ABSTRACT

RECREATIONAL ANGLER SURVEYS: THEIR ROLE AND IMPORTANCE NATIONAL AND THE 2008 MICHIGAN ANGLER SURVEY

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This thesis examines the role and importance of angler human dimensions information in fisheries management; methodological considerations for angler mail surveys; and preliminary results from Michigan recreational angler survey. Our survey of fisheries management agencies serves as a characterization of the collection and application of human dimensions information. Respondents reported wide-spread and frequent human dimensions data collection and a diversity of opinions about the role and importance of human dimensions information in fisheries management. Our survey matrix format which collected information on angler's two most recent trips contained higher itemnonresponse compared to our one-trip format. However the two-trip format collects substantially more information on angler trips and provides an interval between trips, important for measuring angler effort. Our tests of survey materials and hand-signing produced only modest differences in overall response rates. However we report significant differences in our initial response rates, suggesting a faster return for handsigned high quality packages, and subsequent lower follow-up mailing costs. Finally, we present preliminary findings from the initial rounds of the 2008 Michigan recreational angler survey including a summary of the general characteristics of recreational anglers and their angling behavior and an examination of the relationships of various aspects of angling behavior and demographic characteristics.

To my wife Katherine, and to my family, Joseph, Christine, Marlena and Troy.

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CHAPTER 1: The collection, utilization and importance of angler human dimensions data: A survey of U.S. fisheries management agencies

INTRODUCTION

Researchers have used a variety of approaches to assess the management priorities of fisheries management agencies (e.g. Voiland 1984; Ross and Loomis 1999; Bennett et al. 1978; Mather et al. 1995; Wilde et al. 1996; Gabelhouse 2005). Each of these studies also measured the importance of specific human dimensions information items to fisheries management goals. Given the limited distribution and publication of many statewide angler surveys (Brown 1991; Wilde et al. 1996) the management interests and information needs of fisheries management agencies may be better assessed by a direct examination of the frequency and content of surveys conducted by fisheries management agencies (Wilde et al. 1996).

We conducted telephone interviews with U.S. fishery management agencies about their collection, utilization, and attitudes toward human dimensions data. Our objectives were to: assess the reported quality, utilization and importance of human dimensions data and information; characterize the staffing and infrastructure available to support angler human dimensions data collection and utilization; and finally, document contemporary management interests and information needs related to human dimensions. Compared to earlier findings (e.g. Ross and Loomis 1999; Wilde et al 1996; Gabelhouse 2005) we expected our respondents to report increased experience in conducting and analyzing angler human dimensions research, increases in the number of positions allocated to

collecting and analyzing human dimensions information, widespread human dimensions data collection by fisheries management agencies, and relatively greater importance placed on the human dimensions information items presented.

METHODS

In order to identify human dimensions contact persons at each fisheries program, we established primary, secondary and tertiary sources: 1) fisheries management agency websites; 2) *Human Dimensions of Recreational Fisheries American Fisheries Society Committee* list (http://lutra.tamu.edu/hdcom/, August 2007; and finally, 3) a "cold call" to fisheries management state headquarters. Telephone calls were made over a 5 month period from September 2007 to January 2008. A scripted introduction paragraph was read to all respondents in order to introduce the interviewer, the research project and identify the appropriate human dimensions contact person within each fishery management agency (Appendix A). Once the appropriate respondent was identified, we proceeded with the interview.

We employed telephone interview methods in order to achieve a high response rate, bring additional qualitative data to our analysis, and ensure that questions were answered chronologically, by a single respondent. In order to minimize interviewerrelated error and maximize survey reliability and validity, we standardized our interviewing procedures (Biemer and Lyberg 2003 pg 151). All of our interviews were conducted by one individual and each question was read to the respondent exactly as it appeared on the survey instrument. We framed our inquiry to include all angler human dimensions data collection efforts at all scales (e.g., local, regional and statewide).

Before proceeding with the interview, the researcher began by defining (for the purposes of the study) economic and human dimensions information.

Respondents were not generally probed on their answers but were asked to expand on comments or statements that were unclear to the interviewer. Respondents offered a wide range of comments when prompted by 7 open-ended questions containing "other" categories, and at all points throughout the interview. Respondent's comments were not discouraged at any point during the interview. Unscripted conversation did occur, often at the end of the interview, however an effort was made to keep interviewer comments and conversation standardized between surveys. Notes were kept on open ended discussions and the entire interview was audio-taped.

All quantitative data were entered using a double-key data entry method. Qualitative data were coded by a single investigator familiar with the objectives of this research. We used SPSS Statistics 17.0® to calculate descriptive statistics, transform variables and to compare means using an ANOVA F-test.

RESULTS

We completed interviews with respondents from all 50 states and Washington D.C. Six states maintained separate marine and inland staff responsible for angler human dimensions information, brining the total number of conducted interviews to 57. Fifteen respondents were identified through fisheries management agency websites; 13 through *Human Dimensions of Recreational Fisheries American Fisheries Society Committee* list (http://lutra.tamu.edu/hdcom/, August 2007, and the remainder, 29, were identified through a "cold call" to fisheries management state headquarters. In three separate cases we had inaccurate respondent contact information, and in one case, repeated attempts to reach a respondent did not produce an interview (unreturned telephone call). Following our survey protocol we converted these three potential nonresponse cases into interviews by utilizing our secondary and tertiary resources to identify alternative human dimensions contact persons. In a very limited number of cases, respondents were unable to answer interview questions, reporting that either their program had not collected angler economic or human dimensions information or that they simply did not know the answer to a particular question.

We tracked the number of occasions in which an initial telephone call to a potential survey respondent resulted in a recommendation for a new contact in order to quantify the level of difficulty encountered in identifying the appropriate human dimensions contact person within each fisheries management program. On 30 separate occasions, the potential respondent we identified through our primary (fisheries management agency websites), secondary (Human Dimensions of Recreational Fisheries American Fisheries Society Committee list), or tertiary sources (cold call to fisheries management state headquarters) resulted in at least one referral. We tracked this as "persons removed" and this number ranged from 1 to 2 persons. On six occasions, survey respondents identified through our primary resource were 1 person removed from our original contact, resulting in an average of 0.4 additional telephone calls. Similarly, on five occasions, survey respondents identified through our secondary source were 1 person removed from our original contact, on three occasions survey respondents were 2 persons removed, resulting in an average of 0.8 additional telephone calls. Finally, on eleven occasions, survey respondents identified through our tertiary source were 1 person removed from the person who was recommended to us, on five occasions survey

respondents were 2 persons removed, resulting in an average of .75 additional telephone calls.

In order to examine differences in attitudinal and opinion measures between respondents, we coded survey respondents by job title into one of three broad job categories: Upper Management (e.g., Division Chief; Management Supervisor; Assistant Director); Human Dimensions Staff (e.g., Human Dimensions Biologist; Responsive Management; Economist); and, finally, Biologists (e.g., Fisheries Biologist, Biology Specialist, Research Specialist). Approximately one-third of our respondents were coded as Upper Management; 18% were coded as Human Dimensions Staff, and 48% were coded as Biologists (Table 1).

Human Dimensions Data Collection

Respondents from 50 states and the District of Columbia reported that their fisheries program had collected human dimensions information from anglers, and respondents from 45 states reported that their fisheries program had specifically collected economic information from anglers. Respondents reported that their fisheries program had been collecting angler human dimensions information for as many as 76 years, to as few as 4 years, with a median of 27 years (mean = 29.7 years). Seventy-one percent of respondents reported that their fisheries program had conducted angler human dimensions surveys in 2006 or 2007. The year of the most recent data collection ranged from 1996 to 2008 with a median of 0 years (mean = 1.6 years). Ninety-one percent of respondents reported that their fisheries program had collected angler human dimensions data in the previous 5 years. Eighty percent of respondents reported planned collections for 2007 to 2014

with a median of 1 year (mean = .7 years). Eighty-seven percent of respondents reported that their fisheries program had planned to collect angler human dimensions data within the next two years.

Respondents reported that human dimensions staff were available in 18 different state fisheries programs to collect and/or analyze angler human dimensions data and that an economist was on staff for the collection and/or analysis of economic or socioeconomic data in 9 states. Respondents from 10 states reported their agency had a special division, section or department devoted to the collection and analysis of socioeconomic, economic or human dimensions information.

Respondent Experience

Respondent's reported a median experience level of 10 years working on human dimensions research with their respective agency (mean = 11.8 years) with a range from 0 to 34 years. Median experience levels varied between by job categories, with biologists reporting the least experience working on human dimensions research at their current agency (p = .061) and upper management reporting the most experience working on human dimensions research at their current agency (p = .061) and upper management reporting the most experience working on human dimensions research at their current agency (p = .023) (Table 1).

Data Quality and Utilization

Respondents' average rating of the overall quality and overall utilization of human dimensions data collected by their fisheries program was 2.9 and 2.7, respectively on a 4 point Likert-type scale: [Poor (1), Fair (2), Good (3), Excellent (4)]. While the majority of respondents rated both the quality and utilization of human dimensions data collected by their fisheries management agency as excellent or good, human dimensions staff rated the quality of human dimensions information significantly higher (p < .05) than both biologists and upper management staff (Table 1).

Table 1.1. Respondents' experience and ratings of the utilization and overall quality of human dimensions data collected by their agency. Data quality and data utilization ratings on a 4 point scale [1=Poor; 2=Fair; 3=Good; 4=Excellent] * p < .05 ** p < .10

| Question/Item | All States | Biologists | Human Dimensions | Upper Management |
|---|---------------|------------|---------------------|---------------------|
| Survey respondent job categories (N = 57) | 57 | 28 | 10 | 19 |
| Respondent's work on human dimensions research with current agency (median years) | 10 | 7.5** | 12 | 15.5* |
| Data Utilization Rankings | | | | |
| Agency human dimensions data utilization (mean rating) | 2.7 | 2.7 | 2.9 | 2.7 |
| Excellent | 11.0% | 11.5% | 11.1% | 10.5% |
| Good | 53.7% | 50.0% | 66.6% | 52.5% |
| Fair | 31.4% | 34.6% | 22.2% | 31.5% |
| Poor | 3.0% | 3.8% | 0.0% | 5.2% |
| Data Quality Rankings | | | | |
| Overall human dimensions data quality (mean rating) | 2.9 | 2.8 | 3.3* | 2.8 |
| Excellent | 16.3% | 12.0% | 36.3% | 10.5% |
| Good | 61.8% | 64.0% | 54.5% | 63.1% |
| Fair | 18.1% | 20.0% | 9.0% | 21.0% |
| Poor | 3.6% | 4.0% | 0.0% | 5.2% |

Respondents reported on the ways in which human dimensions data were utilized by their agency selecting all that applied from a list of response categories. The majority of respondents reported that human dimensions data were utilized for each of the response categories offered, with a slightly larger number of respondents reporting human dimensions data were utilized in the design of fishery regulations (89%) (Table 2).

| Question/Item | N | All States |
|--|----|------------|
| The design of fishery regulations | 49 | 89.1% |
| Local resource management plans | 46 | 83.6% |
| State-wide strategic resource management plans | 44 | 81.5% |
| Development of angler educational, outreach programs & materials | 38 | 69.1% |
| Other | 19 | 34.5% |

Table 1.2. Respondent's reporting of human dimensions data utilization. Respondents selected all that applied from a list of 4 response categories. Nineteen respondents offered other ways in which human dimensions data was utilized by their agency.

When asked if there were other ways in which angler human dimensions data were utilized by the state agency, nineteen respondents offered additional comments with several themes emerging. Themes related to each of the four original response categories were reiterated as well as additional themes related to fiscal justification and outreach and to a lesser extent, angler recruitment and retention. The frequency (number of times a particular theme was mentioned) and extensiveness (number of individuals who mentioned a particular theme) are provided in Table 3.

| | Frequency | Extensiveness |
|--|-----------|---------------|
| Resource management plans | 14 | 9 |
| Informing legislature / program validation | 8 | 6 |
| Developing regulations | 7 | 6 |
| Public relations / public outreach | 9 | 5 |
| Angler motivations /angler behavior / angler profiling | 7 | 5 |
| Economic information, impacts and valuation | 6 | 4 |
| Marketing to anglers / recruitment retention | 5 | 4 |
| Evaluating programs and services | 3 | 3 |
| Fiscal Justification (state and federal funding) | 3 | 2 |

Table 1.3. Respondent's reporting of human dimensions data utilization. Nineteen respondents offered other ways in which human dimensions data was utilized by their agency. The dominant themes are presented in this table.

State Fisheries Issues

Collectively, respondents rated each of the four potential issues we presented (Habitat Degradation, Access and Facilities, Declining Angler Participation, and State Budget Shortfalls) as moderately or very important issues facing their state's fishery (Table 4). While all respondents rated habitat degradation (invasive species, drought, pollution, development) to be a "very" or "extremely" important issue facing their state's fishery, we found greater variability in respondents' ratings of other issues facing their state's fishery. Both human dimensions and upper management staff rated declining angler participation as very important (4.2) while biologist's rated declining angler participation significantly lower (p < .10) at (3.7). Upper management and biologist respondents rated state budget shortages (3.9) and (4.0), respectively, while human dimensions staff rated state budget shortages significantly lower (p < .10) at (3.3) (Table 4).

Table 1.4. Respondent's ratings of issues facing their fishery management agencies. Respondents rated 4 response categories independently. Ratings are on a 5 point scale [1=Not important at all; 2= Slightly important; 3=Moderately important; 4=Very important; 5=Extremely important]. Thirty respondents offered other issues facing their agency. ****** p < .10

| | All States | Upper Management | Human Dimensions | Biologists |
|--|---------------|---------------------|---------------------|------------|
| Habitat Degradation Rankings | | | | |
| Habitat degradation (mean rating) | 4.7 | 4.7 | 4.7 | 4.7 |
| Very important | 29.0% | 33.3% | 30.0% | 25.9% |
| Extremely important | 70.9% | 66.6% | 70.0% | 74.0% |
| Access and Facilities Rankings | | | | |
| Access and facilities (mean rating) | 4.1 | 4.3 | 3.9 | 4 |
| Slightly important | 5.5% | 5.5% | 11.0% | 3.7% |
| Moderately important | 12.9% | 5.5% | 22.0% | 14.8% |
| Very important | 48.1% | 44.0% | 33.0% | 55.5% |
| Extremely important | 33.3% | 44.0% | 33.0% | 25.9% |
| Declining Angler Participation Rankings | | | | |
| Declining angler participation (mean rating) | 4 | 4.2 | 4.2 | 3.7** |
| Not important at all | 1.8% | 0.0% | 0.0% | 3.7% |
| Slightly important | 5.4% | 5.0% | 10.0% | 3.7% |
| Moderately important | 23.6% | 16.6% | 20.0% | 29.6% |
| Very important | 30.9% | 27.7% | 10.0% | 40.7% |
| Extremely important | 38.1% | 50.0% | 60.0% | 22.0% |
| State Budget Shortages Rankings | | | | |
| State budget shortages (mean rating) | 3.8 | 3.9 | 3.3** | 4 |
| Not important at all | 3.7% | 5.5% | 0.0% | 3.8% |
| Slightly important | 7.4% | 5.5% | 20.0% | 3.8% |
| Moderately important | 25.9% | 22.0% | 50.0% | 19.2% |
| Very important | 27.7% | 27.7% | 10.0% | 34.6% |
| Extremely important | 35.1% | 38.8% | 20.0% | 38.4% |

When asked if there were other important issues facing their state's fishery, 30 respondents offered additional comments with several themes emerging. Themes related to each of the four original response categories were reiterated as well as additional themes related to fiscal issues and outreach, aquatic health and to a lesser extent

recruitment and retention. The frequency (number of times a particular theme was

mentioned) and extensiveness (number of individuals who mentioned a particular theme)

are provided in Table 5.

| Table 1.5. Respondent's ratings of issues facing their fishery mana | agement agencies. Thirty respondents |
|--|--------------------------------------|
| offered other issues facing their agency, 7 themes are presented bel | low. |

| | Frequency | Extensiveness |
|--|-----------|---------------|
| Budget issues / program funding / state funding | 7 | 6 |
| Angler experience / quality fishing / recruitment retention | 7 | 7 |
| Fish disease / disease effects on stocking | 7 | 6 |
| Water quality / water shortage / habitat degradation | 7 | 6 |
| Staffing shortages / inability to hire staff | 7 | 6 |
| Public education / public awareness | 6 | 5 |
| Exotic species / invasive species / illegal introductions / restoring native populations | 5 | 4 |
| Threatened and Endangered Species | 3 | 3 |

Importance of Human Dimensions Information

Collectively, respondents rated each of the human dimensions information items presented as very or moderately important to fisheries management decision making. We report respondent's collective mean importance ratings, the means reported by each job category (Biologists, Human Dimensions, and Upper Management), as well as the means reported by Wilde et al. (1996) (Table 6). Our mean ratings and rank order are similar to those reported by Wilde et al. (1996), with the exception of species-specific market information, which had a mean importance score significantly higher (p < .05) than the mean reported by Wilde et al. (1996). Human dimensions respondents rated five of the eight human dimensions information items higher than both biologists and upper management staff, with angler satisfaction and economics of recreational fishing rated significantly higher p < .10 (Table 6).

Table 1.6. Respondent's mean ratings of the importance of human dimensions information items to fishery management decision making. Ratings are on a 5 point scale (1=Not important at all; 2= Slight) important; 3=Noderately important; 4=Very important; 5=Extremely important]. Mean ratings reported by Wilde et al. (1996), our national mean importance ratings and the means for Biologists, Human Dimensions staff and Upper Management are presented. * $p < .05 \approx p < .10$

| | 1996 | 2007 | | | | |
|--|------------------------|------------|------------|---------------------|---------------------|--|
| | Wilde et al. (1996) | All States | Biologists | Human Dimensions | Upper Management | |
| Angler support for management regulations | 4.2 | 4.1 | 4 | 4.2 | 4.2 | |
| Angler satisfaction | 3.9 | 3.9 | 3.8 | 4.3** | 3.9 | |
| Angler attitudes and opinions | 4.1 | 3.9 | 3.8 | 4.0 | 3.8 | |
| Species-specific market information | 3.1 | 3.7* | 3.7 | 3.8 | 3.6 | |
| Economics of recreational fishing | 3.6 | 3.6 | 3.6 | 4.1** | 3.4 | |
| Angler motivations | 3.4 | 3.3 | 3.3 | 3.1 | 3.5 | |
| General Public attitudes and opinions | 3.4 | 3.2 | 3.2 | 3.2 | 3.3 | |
| Demographic characteristics of anglers | 3.1 | 3.1 | 3.1 | 3.0 | 3.3 | |

Partnerships

The fifth and final section of the survey contained 4 questions about partnerships leveraged to: 1) communicate with anglers; 2) develop fishing programs, activities and services; 3) gather economic data; and, 4) gather human dimensions data. Respondents reported partnerships with recreational businesses clubs and organizations to communicate with anglers and develop programs activities and services, with a shift toward partnering with colleges and universities and consulting firms to collect economic and human dimensions data (Table 7). When asked if there were other partnerships leveraged, respondents offered additional comments with several themes emerging. The frequency (number of times a particular theme was mentioned) and extensiveness (number of individuals who mentioned a particular theme) are provided in Table 8. Table 1.7. Respondent's reporting of partnerships leveraged to conduct four tasks: communicating with anglers; developing fishing programs, activities and services; collecting angler economic data; and collecting angler human dimensions data.

| | Colleges/ Universities | Recreational Business | Clubs, organizations, foundations | Consulting Firms |
|---|---------------------------|--------------------------|---|---------------------|
| Communicating with anglers | 63% | 68% | 90% | 32% |
| Developing programs, activities and services | 47% | 74% | 88% | 21% |
| Collecting Economic data | 61% | 26% | 26% | 46% |
| Collecting human dimensions data | 65% | 23% | 35% | 53% |

Table 1.8. Respondents reporting of other agency partnerships to conduct four tasks: communicating with anglers; developing fishing programs, activities and services and collecting economic data and human dimensions data.

| | Communic ating with Anglers | | Developing Fishing Programs, Activities and Services | | Collecting Economic Data | | Collecting Human Dimensions Data | |
|--|-----------------------------------|---------------|--|---------------|--------------------------------|---------------|---|---------------|
| | Frequency | Extensiveness | Frequency | Extensiveness | Frequency | Extensiveness | Frequency | Extensiveness |
| Federal Agencies (USFSW; BLM: USFS, etc.) | 13 | 11 | 10 | 9 | 9 | 9 | 9 | 8 |
| State Agencies | 23 | 9 | 11 | 6 | 0 | 0 | 2 | 2 |
| Media | 8 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Agency / Internal | 3 | 2 | 2 | 0 | 2 | 2 | 2 | 2 |
| Mulit-state organizations / quazi- governmental organizations | 5 | 5 | 1 | 1 | 2 | 1 | 1 | 1 |
| Recreational Industry / Recreational Shows | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Conservation groups / NGO's / Sportsman's groups | 12 | 12 | 2 | 2 | 0 | 0 | 0 | 0 |
| Public/community orgs/local governments and councils | 11 | 8 | 11 | 10 | 0 | 0 | 3 | 2 |

DISCUSSION

Human Dimensions Data Collection

Wilde et al. (1996) hypothesized that as human dimensions information became more important to fisheries management activities, there would be a corresponding increase in the frequency of surveys conducted by management agencies. We asked respondents several questions to determine the frequency of all angler surveys (e.g., local, regional and state-wide) being conducted by their fisheries program, developing baseline information for this inquiry. Nearly three-quarters of respondents indicated that their fisheries management program had conducted angler human dimensions surveys in the previous 2 years, over 90% collect this information in the previous 5 years, and 80% reported planned collections in the next two years. However, when asked how many years their fisheries program had been involved in the collection of human dimensions data, 20 respondents gave indistinct timeframes often coupled with comments about the irregularity of their human dimension surveys efforts.

"I couldn't tell you the exact date." (20 respondents made similar comments)

Additionally, many respondents were unable to tell us when the next planned collection of human dimensions data would occur, or gave vague answers:

"Unknown" (9 respondents made similar comments)

Experience and Staffing

Wilde et al. (1996) predicted that with increased importance given to human dimensions information, there would be a corresponding increase in trained human dimensions personnel within fisheries management agencies. We did not collect information on respondent's education or training, and we also suspect that a diversity of backgrounds is represented by our respondents, with some respondents obtaining formal training and education in the social sciences. Collectively, we found respondent's median experience working on human dimensions research with their respective agency to be 10 years with a range from 0 to 34 years (mean = 12 years). This is an increase from 8 years of median respondent experience reported by Wilde et al. (1996), and indicates that at least by this measure, the collective experience of human dimensions staff may be increasing.

Gabelhouse (2005) surveyed 41 U.S. inland fisheries programs and found that twelve states had dedicated personnel to planning and human dimensions for fisheries, accounting for 0.3% of inland fisheries programs employees nationwide. Respondents from our study reported that human dimensions staff were available in 18 different state inland fisheries programs to collect and/or analyze angler human dimensions data, (likely an increase since Gabelhouse, 2005) with 9 states employing an economist for the collection and/or analysis of economic or socioeconomic data. Additionally, respondents from 10 states reported their agency had a special division, section or department dedicated to the collection and or analysis of human dimensions data. When asked about the availability of staff to collect and analyze human dimensions data or the presence of special units devoted to working on the collection and analysis of human dimensions related information, several respondents commented on the lack of qualified staff or the lack of staff specifically dedicated to conducting human dimensions data collection and analysis. Several researchers have reported on the lack of human dimensions training and interdisciplinary learning in the conservation sciences and fisheries and wildlife management (Kelso and Murphy (1988); Fox et al. (2006); Ditton (2004)). Comments such as the following may illustrate a lack of human dimensions training, especially

given our respondent's responsibility for human dimensions research at their respective agencies:

"This may be a stupid question, but what is human dimensions information?" -Respondent, Human Dimensions Staff

"When you say human dimensions, you're talking the actual...you're not talking harvest survey, everything like that?" -Respondent, Biologist

"When you say human dimensions that is where I am kinda getting the hangup here."

-Respondent, Upper Management

"... it depends on what we include as human dimensions." -Respondent, Biologist

The following comments, (made in direct response to our question about the

availability of staff to collect and analyze human dimensions data) and similar comments

pertaining to staffing shortages and inadequate staffing and program funds elsewhere in

the interview, may suggest continuing human dimensions staffing and programming

challenges.

"I'm a fisheries biologist, we're all fisheries biologists. A lot of us have had statistics classes, but there's no specific training, there's no survey person." (7 respondents made similar comments)

"You're talking to the one and only, but I'm not expressly charged with that as my only duty." (5 respondents made similar comments)

Using our protocol to identify human dimensions contact persons at each fisheries program, 15 respondents were identified through fisheries management agency websites; 13 through the *Human Dimensions of Recreational Fisheries American Fisheries Society Committee* list (http://lutra.tamu.edu/hdcom/, August 2007 and the remainder, 29, were identified through a "cold call" to fisheries management state headquarters. On 30 separate occasions the potential respondent we identified through our primary, secondary or tertiary sources resulted in at least one referral. These results suggest that at least in some states, there may be some confusion about who the angler human dimensions contact persons are within the fisheries program.

Data Quality and Data Utilization

While not statistically significant, overall respondents rated the quality of human dimensions data collected by their agency higher than data utilization, with human dimensions staff rating data quality significantly higher than biologists and upper management staff. However, an equal and lower percentage of biologists, human dimensions and upper management staff rated data utilization as excellent. The lower ratings attributed to data utilization may be illustrated by the comments offered by 3 respondents:

"...as far as the final decisions, when they weigh everything, I don't know how they weight what they consider when they consider what group gets certain regulations or when we have to cut down fishing mortality. I'm not sure how that plays in."

"We just haven't been as aggressive in applying the knowledge that we gain from the surveys as we should."

"I think we could do a better job. I think we all recognize that we need more of it but again, we're on a fixed budget – we work strictly on the hunting fishing license and boating registration, we don't get general revenue money so, a lot of times we can't do all the things we want to do, and sometimes those surveys are easier to cut than people or equipment. But we fight for them a lot...So I think our agency's doing a good job, but we can do better."

Respondents reported on the ways in which that human dimensions data were utilized, selecting all that applied from a list of response categories and were asked if there were other ways in which angler human dimensions data were utilized. Nineteen respondents offered additional comments, with each of the four original response categories reiterated and several new themes also emerging. The majority of these comments could be grouped into one of two broad categories: fiscal justification / outreach [i.e., public outreach; informing legislature; communicating economic impacts; other fiscal iustification] and to a lesser extent recruitment and retention [i.e., angler marketing; angler motivations]. These results suggest that angler human dimensions data are also utilized to communicate the mission of fisheries management agencies and the economic and other societal benefits of angling activities. In their survey of the heads of freshwater fisheries management agencies, Ross and Loomis (1999) reported that most agencies indicated they were spending more time developing public education programs. Arlinghaus (2006) linked habitat degradation to inadequate communication of the social and economic importance of recreational fisheries to non-fishery stakeholders and the public, recommending programs to increase the awareness of the social and economic importance of recreational fishing. Our findings are not surprising given that previous surveys of fisheries management agencies have shown that at least 23 states received funds from state public tax revenues, 14 of which received line item funds that legislators vote on annually or biannually; 5 a dedicated proportion of state sales tax, 2 received a dedicated proportion of state income tax, and 6 listed other state tax revenues (Ross and Loomis 1999).

State Fisheries Issues

All of our respondents rated habitat degradation (invasive species, drought, pollution, development) to be very or extremely important issue facing their fishery, making it the most important issue rated by respondents. Additionally, when asked about other issues facing their state, six different respondents reiterated issues related to habitat degradation (water pollution, water shortage, water quality), discussed below. These findings support previous research finding that habitat deterioration is consistently among the most important issues facing fisheries agencies nationwide (Ross and Loomis 1999).

In recent decades, the USFWS National Survey of Fishing, Hunting, and Wildlife-Associated Recreation has reported continued declines in angling participation (U.S. Department of Interior 2006) and there is evidence in the literature that agencies are placing a major emphasis on angler recruitment issues (Mather et al. 1995). However, our results suggest there is variability among our respondents in rating the importance of angler recruitment and retention, with biologists rating this item significantly lower than Human Dimensions staff and Upper Management staff. This variability likely reflects differing perceptions of the causes and consequences of declines in angler participation as well as local (state) conditions. Four respondents specifically reiterated issues related to angler recruitment and retention when asked about other issues facing their state. Eight respondents offered comments in addition to their numerical rating of declining angler participation, reflecting a range of levels of concern with declines in angler participation:

"We haven't experienced a decline."

"...becoming important"

"We are not really experiencing a decline yet. We are kind of leveling out, but I guess compared to our population growth it is in decline, so I'm going to say very important."

"We're losing a lot of anglers. We've really taken a hit."

"That's the number 1 issue on our plate right now."

When asked if there were other important issues facing their state's fishery, 30 respondents offered additional comments with several themes emerging. The majority of comments offered by respondents could be grouped into one of three broad categories: fiscal issues / outreach [e.g. staffing shortages, budget and program funding, public outreach and education]; aquatic health [e.g. water quality, invasive species, non-native species, fish disease and hatchery issues, fish passage] and to a lesser extent recruitment and retention [quality of fishing, recruitment and retention, angler education].

Nationally, more than half of total state budgets for fisheries management are directed toward hatchery production and stocking and the analysis of put and take regulations (hatchery and stocking programs alone require an average of 33% of all fisheries expenditures) (Ross and Loomis 1999). These stocking activities resulted in an estimated 1.7 billion fish being stocked in 2004 alone, largely accomplished by state fisheries management agencies (Halverson 2008). Six respondents specifically raised concerns about fish diseases and the effect of fish diseases on hatchery production.

Another theme raised by respondents was public education / public awareness. Ross and Loomis (1999) found that developing public education programs was "very" or "extremely" important to 63% of the heads of freshwater management agencies they surveyed, and 89% of respondents reported spending more time on public education programs than they had 10 years ago (Ross and Loomis 1999).

Importance of Human Dimensions Information

The majority of our mean ratings for the importance of human dimensions information items were equal to or slightly less than the mean ratings reported by Wilde et al. (1996) with our overall ranking similar to those reported by Wilde et al. (1996).

Wilde et al. (1996) maintained that respondents may attach greater importance to more "traditional" human dimensions information items, specifically angler motivations, angler satisfaction, and, angler support for management regulations. Our mean rating for angler satisfaction was equal to the mean rating reported by Wilde et al. (1996) and our mean rating of angler motivations was lower than the mean rating report by Wilde et al. (1996). Ross and Loomis (1999) reported that 76% of the heads of fisheries management agencies surveyed ranked the importance of gaining angler acceptance of regulations as "very" or "extremely" important management activity and that most agencies were spending more time on this gaining angler acceptance of regulations. While angler support for management regulations was the highest ranked item in our survey overall, our mean rating was equal to the mean rating reported by Wilde et al. (1996), and we report only a 2% increase in the percentage of respondents' rating this item very or extremely report compared to Wilde et al. (1996). These results suggest little if any change in the importance of these information items. The following comment was made in direct response to our question about the importance of angler support for management

regulations, which may illustrate respondents' perception of the utility of this

information:

"When a management regulation is being proposed that does not have popular support we often find it mired in debate or even in the courts, I would say for that reason that angler support is very important." -Respondent, Human Dimensions Staff

Our national mean rating for the importance of angler attitudes and opinions was 3.9. This mean rating is lower than the mean rating of 4.1 reported by Wilde et al. (1996). The following comment was also made in direct response to this interview question:

"There is always someone who is not happy so we try to stick with the science." -Respondent, Biologist

Though ranked as relatively unimportant in their survey, Wilde et al. (1996) predicted that species specific angler market information would become important in recruitment and service delivery, and we report a significant increase in the importance of this issue compared the earlier findings of Wilde et al. (1996). While probably a more recent trend, these results may suggest that agencies are more inclined to manage toward a specific fishery or a specific angler market, rather than toward more general attitudes, opinions, and preferences. However, while not representative of a trend toward a greater emphasis on species-specific market information, one respondent offered these comments in direct response to this question which may suggest some skepticism:

"We have some hard core loud musky fishermen who are pushing for more stocking, more regulations, more this more of that. You have to listen, but that doesn't mean you have to do anything.we hear them and we are listening to them, but we are not doing anything because we've already done a whole lot and they can comprise [a small proportion] of the angler population, so it is almost irrelevant." – Respondent, Biologist A possible explanation for these and similar comments (above) provided in the literature is that managers may feel that the public involvement process is heavily influenced by special interests (Mortenson and Krannich 2001). Mortenson and Krannich (2001) analyzed Utah Division of Wildlife Resources manager's to determine their range of acceptance for public involvement in management decisions. Respondents to their survey indicated that the process needed to provide for a better representation of Utah's wildlife interests, claiming that the public involvement process is currently dominated by consumptive-oriented special interests.

Our national mean rating for the importance of general public attitudes and opinions was lower than the mean reported by Wilde et al. (1996). Arlinghaus (2006) described one of the greatest challenges currently facing recreational fisheries as striking the balance between sound management decisions to ensure viable recreational fisheries and the aesthetic and nature conservation values held by people in the 21st century. The following comment (offered in response to our question about the importance of general public attitudes and opinions) may capture the viewpoints held by other respondents particularly for those agencies now faced with public education / public awareness issues in their state, and those respondents who cited the legislative process as an additional application for human dimensions data:

"...because we actually get a sales tax or part of a sales tax, so we have to pay attention to what the general public think." -Respondent, Upper Management

Our national mean rating for the importance of demographic information was equal to the mean reported by Wilde et al. (1996) who pointed out that although demographic information had at that time received attention in fisheries literature, their survey respondents viewed demographic information as relatively unimportant.

The mix of demographic conditions occurring in industrialized societies may have both negative and positive influences on angling demand (Aas and Arlinghaus 2009). Researchers have also emphasized that angler participation and behavior may also be influenced by other attributes (social background, culture and personality) (Aas and Arlinghaus 2009; Hunt and Ditton 2002) as well as the actions of fisheries managers (Aas and Arlinghaus 2009; Ditton 2004). Together, understanding constraints to participation for angler subgroups with lower rates of participation and the socialization process and benefits sought by minority populations and improving accessibility for these groups may reverse many of the trends forecasted (Ditton 2004).

While demographic information may not be an important human dimensions information item for states not currently experiencing rapid demographic changes, researchers have documented increased conflicts as a result of new user groups entering recreational angling with different meanings attached to several aspects of recreational fishing (Aas and Arlinghaus 2009). While not necessarily representative of our respondents, comments like the following may summarize the types of management difficulties facing (or soon to face) fishery management agencies experiencing demographic changes:

"...[our state] has a very diverse demographic component, a lot of different cultures, nationalities of folks from various corners of the world and along with that a different perspective on resource conservation and a lot of times we are not necessarily up against an individual who has a lot of potential to break the law,

but entire cultures that have a different perspective about various laws." Respondent, Biologist

Partnerships

The fifth and final section of the survey contained 4 questions about partnerships leveraged by the agency. Wilde et al. (1996) reported that more than half of statewide surveys were conducted in house, and 66% were analyzed in house, suggesting that agencies may not be developing partnerships with the broader human dimensions research community. However, the majority of our respondents reported leveraging partnerships with colleges and universities and consulting firms to collect economic data and human dimensions data. Ditton (2004) suggested that managers may depend mainly on social and economic data from the National Survey of Fishing, Hunting and Wildlife-Associated Recreation for human dimensions data. The majority of respondents offering additional partnerships leveraged to collect economic and human dimensions data cited federal agencies, four respondents specifically mentioned the U.S. Fish and Wildlife Service (USFWS).

Our findings document the diversity of opinions and attitudes toward human dimensions data collection and application and provide an update on the status of human dimension data collection and information management by fisheries management agencies. A minority of states reported having human dimensions staff in place to collect and analyze human dimensions data, and the comments from many of our respondents suggest that much of the human dimensions program oversight may be ancillary to their primary fisheries duties. Our findings also documented that some agencies had difficulty identifying their angler human dimensions contact persons. While the median experience
level of our respondents was higher than that reported by Wilde et al. (1996), many respondents were unable to provide basic information on data collection efforts (most recent, or next planned) and displayed a lack of basic knowledge about the field of human dimensions. Respondent's rankings of human dimensions information items suggest little increase in the perceived value and importance of human dimensions information to decision making. However our findings can help align human dimensions inquiries with the information needs of fisheries managers. Further, our findings reinforce the importance of interdisciplinary research experience in fisheries management curricula and training.

CHAPTER 2: The Michigan Recreational Angler Survey: Examining long term, cost effective, statewide recreational angler survey strategies

BACKGROUND AND RATIONALE

Over the last 25 years, the fisheries management literature has underscored the importance of applying angler human dimensions information to fisheries management decision making. Research scholars argue that this information may be used to: better understand the resource and social needs of anglers (Brown 1987); appropriately allocate natural resource and management funds (Fisher 1997); protect, restore, and enhance fishery resources for present and future generations (Bray et al. 1996); ensure that harvest regulations, fish stocking and habitat enhancement efforts are effective (Pollock et al. 1994); provide the diversity of opportunities desired by anglers (Connelly et al. 2001); implement rules and regulations with knowledge of which angler groups will be most affected (Fisher 1997); develop outreach programs, particularly for minority and nontraditional angler groups (Ditton 2004); and, understand the impact of anglers on fishery resources (Lupi et al. 2005). Representative angler survey information may also be used to, benchmark the results of existing non-random angler surveys (Lupi 2004) and they can be used to supplement data from the U.S. Fish and Wildlife Service, National Survey of Fishing, Hunting and Wildlife Associated Recreation (Lupi 2004; Brown 1991).

The Michigan Department of Natural Resources (MDNR) has been credited as one of the first states to initiate statewide mail angler surveys to collect biological and user profile data in the Great Lakes system (Brown 1987). These surveys helped to determine angler's state-wide pattern of fishery resource use (Jamesen 1985a and 1985b; Mahoney et al. 1991). Examples of the type of information collected during these surveys included: total angler effort, spatial and temporal distribution of angling effort, and spatial distribution of catch by species (but not for site-specific harvest) (Lupi et al. 2005). However, these surveys were discontinued in the mid 1980's. Since that time the MDNR Fisheries Division has conducted only occasional human dimensions surveys to support individual projects or to react to management issues. This approach has left the MDNR Fisheries Division with uncoordinated and un-standardized angler human dimensions data collection efforts being undertaken as separate projects over time (Lupi et al. 2005).

The Michigan Recreational Angler survey is a result of an MDNR funded project proposal: F 81-R-8, Study 230548-4, "A state-wide survey of Michigan's licensed anglers". One of the objectives of this study was to design and initiate a cost effective, long-term statewide angler survey strategy. The Michigan Recreational Angler survey instrument is designed to collect information on the status and distribution of angling effort for all of Michigan's fisheries. Over time, the survey could be used to track the status and trends of Michigan's recreational anglers and their resource use including behaviors, spatial distribution, trip characteristics and data for economic analysis. The survey instrument and sampling strategy were designed to strike a balance between achieving data collection needs and minimizing response error, nonresponse error and sampling errors.

Angler Survey Challenges

For a variety of reasons, survey responses related to a range of important parameters often being tested (e.g. effort, catch, expenditures) tend to differ to some degree from what actually transpired (Pollock et. al 1994 pg 52). Longer recall periods are prone to more recall bias (e.g. Bence 2005; Chase and Haranda 1984; Fisher et al. 1991; Pollock 1994 pg 52; Westat 1989). Annual recall has produced overestimates of fishing effort and catch and underestimates of expenditures (Pollock et al. 1994 pg 52). Other response errors include deliberately misreporting data, social desirability bias (Pollock et al. 1994 pg 53), misidentification of fish species (Pollock et al. 1994 pg 71); digit preference (Pollock et al. 1994 pg 71), and "satisficing" (Biemer and Lyberg 2003 pg 124; 135). Finally, nonresponse bias (Brown (1991); Pollock et al. (1994 pg 71); Dillman (2007 pg 10); McClanahan and Hansen (2003); Connelly et al. (2001)) and itemnonresponse (Dillman 2007 pg 79-148) are some additional forms of bias documented in survey research literature.

Advantages and Disadvantages of Angler Surveys Methods

Access point and roving creel survey methods have been used to, and are particularly effective for, collecting site-specific information on fishing effort, harvest and biological characteristics of fish caught (Pollock et al. 1994). Direct observation and the ability to collect data from anglers on-site reduces some biases including recall biases (Pollock et al. 1994 203) and prestige bias (Westat 1989). Creel surveys have also experienced generally higher response rates (McClanahan & Hansen 2003). Although it may be possible to add human dimensions questions to creel surveys, long interview

periods may not be tolerated by anglers, and longer per respondent interview periods may in effect, reduce the total number of respondents surveyed as part of the sampling effort (Brown 1991; Pollock et al. 1994 pg 205). Information collected face-to-face may also be subject to interviewer effects (Biemer and Lyberg 2003 pg 190; Brown 1991), which may ultimately lead to different management strategies (O'Bara 1991). Social desirability bias (Biemer and Lyberg 2003 pg 190), nonresponse, (McClanahan and Hansen 2003) as well as avidity bias and length of stay bias (Pollock et al. 1994, pg 70) have also been documented. Creel surveys cover a limited geographical area and may not be conducted during all fishing periods (McClanahan and Hansen 2003), may not be appropriate where access is diffuse (Pollock et al. 1994 pg 206; Malvestuto 1996) and often focus on effort and harvest of certain species in a particular waterways (Brown 1991). As a consequence, it may be difficult to extrapolate creel data to larger populations or to fully understand inland use which accounts for over 70% of fishing trips in Michigan (Lupi 2004). O'Bara (1991) cautioned that external influences on local fisheries, (e.g. hydrologic changes; new angling opportunities), must be factored before information from creel surveys is extrapolated for long-term management decisions.

More accurate information on trip expenditures and angler's satisfaction may be collected by telephone or mail survey methods from anglers who have recently completed their trips (Brown 1991). Finally face-to-face interviews are generally more costly than other modes of surveys (Biemer and Lyberg 2003 pg 190; Brown 1991). Creel clerks generally require some amount of training (O'Bara 1991) and incur significant transportation and per diem costs (Brown 1991).

Principal off-site surveys methods include: telephone; door-to-door, mail surveys and to some degree, internet surveys. Generally, the cost of off-site methods tends to be lower than the cost of on-site methods (with the exception of door-to-door surveys) (Pollock et al. 1994 pg 206). In these surveys, anglers self report data and human dimensions questions are often included as part of these relatively lengthier surveys (Pollock et al. 1994).

Telephone surveys cover a large geographic area and in the era before widespread cell phone usage, could often obtain higher response rates than mail surveys (McClanahan and Hansen 2003) and may generate a lower cost per respondent than both door-to-door surveys and access and roving creel surveys (Pollock et al. 1994 pg 116). Telephone surveys may produce relatively quicker results; as survey appearance is generally not an issue, survey navigation is primarily the responsibility of the interviewer and data may be entered directly by the interviewer (Pollock et al. 1994 pg 116). Interviewer variance (Biemer and Lyberg 2003 pg 194), recall bias, misidentification and prestige bias have been documented in telephone surveys (Pollock et al. 1994 pg 117). Coverage errors resulting from unlisted numbers and households without telephones (Pollock et al. 1994 pg 117) and nonresponse related to related to changes in household telephone usage (Biemer and Lyberg 2003 pg 194; Dillman 2007 pg 8) further complicate telephone survey methods. Connelly et al. (1997) found that a quarterly telephone survey of Lake Ontario anglers had a recall bias just as large as an annual mail survey. Telephone surveys also tend to have fewer questions, as complicated questions with many response alternatives or complex recall are difficult to perform, increasing the

tendency of respondents to acquiesce and give extreme responses (Biemer and Lyberg 2003 pg 194).

Web surveys have become more widely used with improvements in computer technology and increases in internet access and computer use. The costs of implementing web surveys has also declined and are often less expensive than telephone, mail and faceto-face interviews (Dillman 2007 pg 448-500). However, not all members of survey populations have internet access or the ability to respond to internet surveys. Household random sampling procedures may be complicated by e-mail address structures and cultural and legal barriers (Dillman 2007 pg 448-500). Finally, concerns about computer viruses and privacy issues may contribute to higher incidence of nonresponse (Dillman 2007 pg 448-500).

Mail surveys have been the preferred off-site survey method for many fisheries agencies (Pollock et al. 1994 pg 73; Brown 1991). Mail surveys have the ability to cover a large geographical area and at present are typically the least expensive of off-site methods (Pollock et al. 1994 pg 206; McClanahan and Hansen 2003; Biemer and Lyberg 2003 pg 196; Brown 1991). Because mail surveys are self-administered, mail surveys have a lower risk of social desirability bias (Biemer and Lyberg 2003 pg 196). The mail survey format provides anglers with the time to recall past events, check personal records or consult with others and thoroughly consider their answers to attitude, opinion and preference question (Brown 1991). Mail surveys may also provide types of information that conventional creel surveys do not by relating fishing activity to properties of the individual angler (such as geographic location or residence and license type) (Bence 2005). However, many mail surveys carry the risk of high item nonresponse. Without

an interviewer present available for clarification or guidance, mail surveys must be well constructed so that respondents understand the concepts and are able to navigate through the survey without assistance (Biemer and Lyberg 2003 pg 197; Brown 1991). Longer surveys may decrease response rates and may lead to nonresponse bias, as more avid anglers are more likely to complete surveys (Brown 1991). Researchers conducting mail surveys have little control over the response process including ensuring the intended person completed the questionnaire (Brown 1991). It is also not possible to know if an unreturned questionnaire reached the intended recipient or if the recipient simply chose not to respond. This is can be problematic for computation of response rates and adjusting the estimates for nonresponse (Biemer and Lyberg 2003 pg 196; 197). Lower response rates and the effects of nonresponse bias are of concern in mail surveys making surveys of non-respondents particularly important (Brown 1991). Chase and Harada (1984) report that recall is affected by the respondent's frequency of participation near the end of the recall period, and short recall periods such as a two-week period have been recommended for more accurate data (Gems et al. 1982). A mail survey frame may not contain anglers who are not required to purchase a fishing license or anglers who simply choose to fish without a license (Pollock et al. pg 80). Finally, mail surveys require a relatively long field period for acceptable response rates (Pollock et al. 1994 pg206; Biemer and Lyberg 2003 pg 197; Brown 1991).

Balancing the Advantages and Disadvantages of the Mail Survey

The decision to implement our mailing strategy was made with many of the aforementioned tradeoffs in mind. Several of the disadvantages related to mail surveys are also present to some degree in other survey methods. Our survey instrument and survey strategy were designed to minimize the effects of many of these common survey biases as well as those biases unique to mail surveys. The concurrent collection of angler information unaffected by a longer recall, the need for periodic, comprehensive, systemwide data in Michigan, previously established mail survey methods within other divisions of the MNDR, and the ability to compare information to previous MDNR Fisheries Division research data also influenced our decision to implement statewide angler survey format which retained some aspects of year-long recall (Brown 1991).

Our sample frame includes a simple random sample from the MDNR Retail Sales System database, sampling a broad spectrum of Michigan's licensed recreational anglers. We implemented the National Change of Address (NCOA) to identify and rectify incorrect mailing addresses, and mailed surveys First-Class through the United States Postal Service. Our mailing strategy follows many of the principles outlined by Dillman (2007) with multiple follow-ups, personalized mailings, and progressively urgent appeals in an effort to increase our response rate and reduce nonresponse bias (Pollock et al. pg 80).

We applied many of the strategies described in Dillman (2007) to design a streamlined, salient, user-friendly survey instrument that contains a mixture of closed and open-ended questions covering a range of angling activities, with visual navigation guides between sections and concise instructions. Our survey instrument was designed with multiple choice questions with short lists of possible response categories (informed by a review of relevant literature and a cognitive interview process) including a species checklists to aid in recall (Connelly and Knuth 1993). Because we were surveying licensed anglers, we suspect most anglers will find the topic to be salient / relevant to

their angling behavior and activities, and therefore would be interested in the topic and motivated to provide accurate responses. (Biemer and Lyberg 2003 pg 124; 135)

They survey instrument was designed to capture angling seasonality, cover all fishing activity within Michigan, incur low costs per respondent and collect both short term and longer term trip information balancing the benefits of long recall periods with the needs for accuracy. Longer recall (activities over the last 12 months) are limited to general angler behavior questions: fishing in Michigan (yes/no); participation in fishing events (yes/no); fishing in other countries or states besides Michigan (yes/no); types of waterbodies fished; number of trips taken (range); and fish species sought and methods used.

Shorter recall periods are used for fishing effort (days fished) in the most recent completed calendar month and may include the details of the most recent and second most recent fishing trips. An attempt was made to ensure anglers received their initial survey instrument within 4 weeks of the last day of the month, which should produce more accurate estimates of effort (Brown 1991). Over the course of the calendar year, regular monthly surveys will also permit researchers to examine angler seasonality.

Once the survey is established, issue-based questions and other human dimensions questions could be added to this survey mode at little additional cost and without compromising the integrity of the inventory data and without unnecessary duplication of costs and effort. Data collected in this manner could detect changes in fishing preferences given changes in regulations and environmental conditions and may be incorporated into results from biological surveys of Michigan's lakes and rivers.

Two Tests of Survey Design Options

Two versions of the survey instrument were implemented to test respondent's ability to document the details of their most recent fishing trip versus their two most recent fishing trips. Trip information can be used to describe angler behavior both spatially and temporarily and provides information for economic analysis. Collecting information on the last two trips also provides researchers with the time between trips, an interval measure of angler avidity. These surveys utilized a space saving column matrix format, which may have the disadvantage of lower response rates and higher item nonresponse (Dillman 2007). We also implemented an experiment with four discrete treatments testing the effects of survey packaging, survey materials and personalization on costs and survey response. We tailored our survey strategy following Dillman (2007) to balance costs per survey and maximize response rate. The results of these tests guided our subsequent mailing strategy and may serve to inform similar survey efforts.

METHODS

Questionnaire Development

The survey instrument was initially drafted following a review of published literature, U.S. fisheries management agency survey instruments and survey reports (Simoes, et al. www.msu.edu/~lupi/anglers.html) and related angler survey documents and needs assessment materials developed by the MDNR, the MDNR Fisheries Division and its partners.

MDNR Fisheries Division staff persons were provided with a draft of the questionnaire during their 2007 annual meeting in Alpena, Michigan (October 11, 2007).

A short presentation was also given at this meeting to provide participants with a background, rationale and timeline for the survey. We received important feedback on the design, questions and response categories from the perspective of practitioners, who collectively have many decades of experience interacting with the angling public.

Two rounds of "think-aloud" cognitive interviews as well as "retrospective interviews" were conducted with peers and licensed angler acquaintances to assess the survey questionnaire (Dillman 2007). Techniques and probing questions for this series of cognitive interviews were were modified for our specific purposes following Dillman (2007). The research staff conducting the cognitive interviews, retrospectively probed interviewees on specific questions and sections of the survey. After completing the survey, interviewees were then asked if they found specific sections of the survey difficult to complete, if there were any problems following or understanding the survey instrument, if they had any comments related to the survey instrument, and about the overall appearance of the survey.

During the summer of 2008, retrospective interviews were conducted with acquaintances on June 24^{th} and 25^{th} (N= 7). On July 7, 2008 retrospective interviews were conducted with licensed Michigan anglers encountered at a Lansing, Michigan hunting and fishing sporting goods store (N=18). Patrons with a current Michigan fishing license were asked if they would be willing to assist Michigan State University research staff by taking the Michigan recreational angler survey. Of particular note, we found that 50% of licensed Michigan anglers interviewed during our July 7, 2008 cognitive interviews did not complete a portion of Part C of the survey instrument: "Your Second Most Recent Fishing Trip".

Based on the results of cognitive interviews in June and July, modifications were made to the survey instrument in an effort to provide more concise instructions and to address other issues identified by interviewees. Two versions of the survey instrument were created, one which retained questions to collect data on the most recent and second most recent fishing trips (Appendix B #1), and a second version collected information on only the most recent fishing trip (Appendix B #2). Additional retrospective interviews were conducted with licensed Michigan anglers encountered at the same location in Lansing, Michigan on July 11, 2008 testing both versions of the revised survey instrument (N=20). Once again, patrons with a current Michigan fishing license were asked if they would be willing to assist Michigan State University research staff by taking the Michigan recreational angler survey. During these tests we found 9 of 10 interviewees completed the original format seeking details on the most recent and second most recent trip correctly. This was a considerable improvement from our earlier testing. attributed primarily to our efforts to clarify survey instructions. These cognitive interviews resulted in some important modifications to the survey instrument and informed our test of two versions of the survey instrument during the initial survey waves, discussed later.

Questionnaire

To meet our objectives, the survey instrument contains 20 to 21 multi-part questions over four major sections: Part A) general fishing activities during the last 12 months; Part B) fishing activities during the most recent month (e.g., June, July, August); Part C) details of the recent fishing trip(s); Part D) usual fishing activities, background and demographic information (Appendix B #1 and Appendix B #2). The majority of our response categories are closed-ended, with the exception of questions seeking dates, locations, the numbers of events, the numbers of fish caught and released and respondent's age. Four questions contain an "Other" response choice and provide space for respondents to write-in answers. Due to questions that focus on specific time periods (e.g. fishing activity in the last 12 months and fishing activity in the previous month) some respondents are directed to skip entire sections of the survey. Specifically, anglers who have not fished in the last 12 months are instructed to proceed to the Part D; anglers who have not fished in the most recent month are instructed to proceed to Part C. Following the pretest interviews, we implemented what we feel are intuitive visual navigational guides and concise instructions to direct respondents. Response categories were carefully researched and developed and informed by our cognitive interviews.

We anticipated a large number of respondents will not have fished either in the last 12 months, or in the previous month which will necessitate large sample sizes. Analysis based on fishing behavior (e.g. species targeted; fishing techniques; fishing mode), license type, spatial information (angling location; zip code), and other demographic information will also require larger sample sizes for robust analysis.

Sampling Frame

Our sample frame was the MDNR Retail Sales System database. MDNR recreational angler licenses are effective April 1, 2008 through March 31, 2009 for the 2008-2009 fishing season (however anglers may purchase licenses during the month of March for the upcoming season). In order to sample licensed anglers from the current license year and reduce printing and administrative costs, a simple random sample of 5,000 individuals who purchased fishing licenses between April 1, 2008 and July 31, 2008 was drawn on August 27, 2008. A second random sample of 6,000 individuals who purchased fishing licenses between April 1, 2008 and August 31, 2008 was drawn on September 8, 2008. Each sample includes all possible license types.

Data from the MDNR Retail Sales System were examined and entries missing key information (name of licensee, address of licensee) were deleted. Data with extraneous information was edited for correctness, where possible, or deleted. Licensees with addresses outside the U.S. or Canada were also removed from the sample. Once the final sample was established for a round, each licensee in the sample was assigned a unique project code which was used for the duration of the project. MSU's University Relations Printing Services was contracted to conduct a National Change of Address (NCOA) check of licensees addresses, conduct a mail merge, print, package all components of the mailings and apply the appropriate postage to all mailings. The completed packages were then pre-sorted and mailed First-Class through the United States Postal Service. Each business reply envelope contained the unique code assigned to each individual in our sample.

Data Collection Procedures

The procedures for this mail survey were adapted from the methods in *Mail and Internet Surveys* (Dillman 2007). The first mailing included: 1) a cover letter printed on MSU letterhead explaining the importance and objectives of the survey; 2) the four page survey instrument; and, 3) a self-addressed, postage paid, business reply envelope. The first mailing was followed 5 to 7 days later by a reminder / thank you postcard. Approximately 33 days after the first mailing, non-respondents received a third mailing containing: 1) a second cover letter printed on MSU letterhead which again explained the importance and objectives of the survey with a slightly more urgent appeal; 2) a replacement survey instrument; and, 3) a self-addressed, postage paid, business reply envelope. Approximately 11 days after the third mailing non-respondents received a fourth and final reminder / thank you postcard with a slightly more urgent appeal. Examples of cover letters used in the mailing sequence can be found in Appendix C.

Returned business reply envelopes and undeliverable mailings were grouped by the week of their receipt. All returned mailings were coded to inform follow-up mailings. Additional communications from respondents directed to the principal investigator including short notes, letters, pictures and refusals were coded and filed appropriately. Returning business reply envelopes were opened and the project code appearing on the business reply envelope was written on the top of the corresponding survey. Surveys returning in envelopes other than the business reply envelope were examined for evidence of the sender. The majority of these envelopes contained a return address which could be linked through a separate database to the intended recipient and the project identification code. Five surveys were unidentifiable because they were returned in nonproject envelopes, without an indication of the sender.

Surveys data were entered by technicians. Surveys with unusual responses patters and inconsistencies were identified for further review. Consistent rules were established for measuring usable response (Dillman 2007 pg 9) (e.g., skipped questions and dual responses when single-answer responses were sought). Final editing and quality control were overseen by one individual who is familiar with the survey instrument and the

purpose of the research. The data management process was concluded by merging double-keyed files to detect and correct for differences in data entry.

Testing Trip Details

As previously stated, 50% of licensed Michigan anglers interviewed during an early round of our cognitive interview pretests did not complete Part C of the survey instrument, specifically question 8, "Your Second Most Recent Fishing Trip". While subsequent modifications to the survey instrument resulted in a higher completion rate in a latter round of pretesting (90%), we decided to do a large scale field test of Part C of our survey instrument to compare a version eliciting the most recent trip to a version eliciting the two most recent trips.

Following an examination of the 5,000 records provided by the MDNR on August 27, 2008 with transaction dates beginning April 1, 2008 and ending July 31, 2008, five records were deleted from the database. Two randomly assigned sub-samples were created from the remaining simple random sample resulting in two sub-samples of 2,497 and 2,498 records. An additional 10 addresses were later deemed undeliverable (No Forward; Primary Address Unverified) during the NCOA check.

One sub-sample of the population received the original format which retained questions to collect data on both the most recent and second most recent fishing trips (Version 1) (Appendix B#1). The other sub-sample received the version which collected information on only the most recent fishing trip (Version 2) (Appendix B #2). Both subsamples received four contacts (initial survey instrument and cover letter; first thank you/reminder postcard; replacement survey instrument and cover letter; second thank you/reminder postcard) over the course of six weeks. The cover letters (8.5" x 11" 20#

bond paper) and survey instruments (11" x 17" 24# Domtar Ultra bond paper) were printed in black ink and mailed in a first class windowed envelope. The letters were personalized using a black ink electronic signature. Specific details pertaining to mailing dates and rate of return by field week can be found in Appendix D#1.

We compared our response rates, item non-response, and the number of usable trips for each survey version. We used SPSS Statistics 17.0® to calculate chi-square statistic to test for relationships between our two tests and the characteristics of respondents and non-respondents.

Testing Personalization and Materials

As one part of the personalization method, Dillman (2007) recommends that letters are hand-signed or, alternatively, electronically signed in a contrasting ink color. Dillman (2007) also encourages the use of regular business envelopes and carrying the personalization method through to the letterhead stationary as an "integral connection to personalization efforts". By way of contrast, Dillman (2007) points to techniques commonly used in "mass mailings". While Dillman (2007) reports a collective impact of 5 to 8 percentage points from the use of personalization elements, he does not report on how real versus facsimile signature may contribute to final response rate.

The MDNR Retail Sales System includes the necessary information to personalize materials sent to licensees. Due to the large sample sizes typical of state-wide angler surveys, we do not expect that the MDNR Fisheries Division would employ hand signing or utilize higher quality stationary and envelopes. However, given the long-term nature of this survey effort and the potential for making important contributions to the survey research and human dimensions literature, we felt a test between a non-contrasting

facsimile signature and hand signing and higher quality and lower quality stationary and envelopes was warranted.

Following an examination of the 6,000 records provided by the MDNR on September 08, 2008 with transaction dates beginning April 1, 2008 and ending August 31, 2008, nine records were deleted from the database. Four randomly assigned subsamples were created from the remaining simple random sample resulting in four subsamples of 1,497 and 1499, 1,497, and 1,498 records. An additional 12 addresses were later deemed undeliverable (No Forward; Primary Address Unverified) during the NCOA check. Recipients received four contacts (initial survey instrument and cover letter; first thank you/reminder postcard; replacement survey instrument and cover letter; second thank you/reminder postcard) over the course of six weeks. Specific details pertaining to mailing dates and rate of return by field week can be found in Appendix D #2.

Two sub-samples (totaling 2,991 individuals) received mailings which incorporated many of the principles of the Tailored Design Method (Dillman, 2007) utilizing high quality materials, specifically: a watermarked mailing envelope; a cover letter printed on 24# watermarked paper with a color Department of Fisheries and Wildlife logo; and, a survey instrument printed on 11" x 17" 70# White Domtar paper. Mailing envelopes were addressed by printing the licensee's name on the outside of the envelope. Two thank you/remind postcards were sent at intervals following the receipt of cover letters and surveys. Half of these mailings (1,496 individuals) received cover letters and postcards that were hand signed in blue ink. The remainder (1,495 individuals), received cover letters and postcards that were digitally signed in black ink.

Two sub-samples (totaling 2,987 individuals) utilized lower cost, lower quality materials, specifically: a windowed envelope; a cover letter printed on 8.5" x 11" 20# bond paper with a black and white Department of Fisheries and Wildlife logo, and, a survey instrument printed on 11" x 17" 24# Domtar Ultra bond paper. Two thank you/remind postcards were sent at intervals following the receipt of cover letters and surveys. Half of these mailings (1,494 individuals) received cover letters and postcards that were hand signed in blue ink. The remainder, (1,493 individuals) received cover letters and postcards that were digitally signed in black ink.

We will compare our response rates and costs per unit for each of the four tests conducted. We used SPSS Statistics 17.0[®] to calculate chi-square statistic to test for relationships between our four tests and survey response.

RESULTS

Testing Trip Details

To compare the one-trip versus two-trip versions of the survey, we used data from the sample drawn on August 27, 2008. This simple random sample of licensed anglers drawn from the MDNR Retail Sales System included 4,152 Michigan residents, or 83.1% of the random sample drawn. Non-residents from Illinois, Indiana, Wisconsin and Ohio comprised 3.5%, 3.5%, 2.7% and 2.5% of the simple random sample drawn, respectively.

The mean age of respondents, the proportion of Michigan residents, and the proportion of female respondents was slightly higher than our original simple random sample (Table 1). Resident restricted licensees and 24 hour licensees comprised a slightly lower proportion of respondents, with the remaining license types (Resident All Species; Non-resident Restricted, Non-resident All Species, Senior Restricted, Senior All Species) comprising slightly larger proportions (Table 1).

| Table 2.1. Testing Trip Details. MDNR Sample and Respondentcharacteristics comparison. $N = 2,450$. | | | | |
|---|-------------|---------------|--|--|
| | MDNR Sample | e Respondents | | |
| Michigan Residents | 83.1% | 83.3% | | |
| Non-Residents | 16.9% | 16.7% | | |
| Females | 20.9% | 21.7% | | |
| Mean Age | 45.32 | 49.88 | | |
| Standard Deviation (Age) | 16.06 | 15.78 | | |
| Resident Restricted | 44.3% | 38.5% | | |
| Resident All Species | 26.4% | 28.3% | | |
| Non-Resident Restricted | 5.8% | 6.3% | | |
| Non-Resident All Species | 2.5% | 3.1% | | |
| Senior Restricted | 5.0% | 6.9% | | |
| Senior All Species | 5.3% | 7.8% | | |
| 24 hour | 9.5% | 8.0% | | |
| Other Licenses | 1.1% | 1.1% | | |

Of the 4,995 surveys in our simple random sample, 2,450 were returned. A total of 2,371 surveys were not returned, 169 surveys were undeliverable, 4 individuals refused to participate and 1 was reported deceased (Table 2).

Our survey which asked anglers to document the details of their most recent and second most recent fishing trips produced a 50% response rate, while our survey which asked anglers to document the details of their most recent trip produced a 51% response rate (Table 2). We determined there is no statistically significant relationship between response rates for our two survey instruments (chi-square with 1 degree of freedom = .538, p = 0.463).

Table 2.2. Testing the Michigan Angler Survey: Trip Details. Anglers receiving Version 1, testing respondent's ability to document the details of their two most recent fishing trips, and Version 2, testing respondent's ability to document the details of their most recent fishing trip. NCOA Undeliverable: NCOA address check "No Forward" and "Primary Address Unverified (10); Packages returned by USPS as undeliverable (159); Refusals (4); Deceased (1); Surveys returned (2,450); Surveys not returned (2,371).

| | Most Recent and Second Most Recent Trip | | Most Recent Trip | | Combined | |
|-------------------------|---|---------|------------------|---------|----------|---------|
| Status | Number | Percent | Number | Percent | Number | Percent |
| Response Rate | 50.31% | | 51.24% | | 50.72% | |
| Initially Eliminated | n/a | n/a | n/a | n/a | 5 | 0.10% |
| NCOA Undeliverable | 6 | 0.24% | 4 | 0.16% | 10 | 0.20% |
| USPS Undeliverable | 82 | 3.28% | 77 | 3.08% | 159 | 3.18% |
| Refusals | 1 | 0.04% | 3 | 0.12% | 4 | 0.08% |
| Deceased | 1 | 0.04% | 0 | 0.00% | 1 | 0.02% |
| Surveys Returned | 1212 | 48.52% | 1238 | 49.58% | 2450 | 49.00% |
| Surveys Not Returned | 1196 | 47.88% | 1175 | 47.06% | 2371 | 47.42% |
| TOTAL | 2498 | 100.00% | 2497 | 100.00% | 5000 | 100.00% |

Most Recent and Second Most Recent Trip

A total of 1,212 respondents returned surveys which asked anglers to document the details of their most recent and second most recent fishing trips (Table 2). Among those anglers who returned these surveys 1,141 reported that they had fished in the last 12 months, 20 surveys were returned with this answer blank and 49 respondents indicated they had not fished in the last 12 months. Following survey instructions, anglers who had reported that they had fished in the last 12 months were directed to complete Part C of the survey documenting the details of their most recent and second most recent fishing trips. For the purposes of the present analysis, respondents were considered to have provided "usable data" on their trip if they provided information on at least the month of the trip, waterbody name and information on species targeted, caught or released.

Most Recent Fishing Trip Only

A total of 1,238 respondents returned surveys which asked anglers to document the details of their most recent fishing trip (Table 2). Among those anglers who returned these surveys, 1,178 reported that they had fished in the last 12 months, 12 surveys were returned with this answer blank and 48 respondents indicated they had not fished in the last 12 months. Following survey instructions, anglers who had reported that they had fished in the last 12 months were directed to complete Part C of the survey documenting the details of their most recent trip. Once again, respondents provided "usable data" if they provided information on at least the month of the trip, waterbody name and information on species targeted, caught or released.

Both survey versions experienced relatively higher item non response for specific questions regarding details of the trip location (name of river or lake; nearest city/town/village; county) and relatively lower occurrence of item non-response for questions regarding trip characteristics. Across all trip questions (trip characteristics; trip location; fishing mode; fish targeted caught and released), item non-response rates for the most recent trip in Version 1 and Version 2 were similar. However, item non-response rates for the second most recent trip questions were often 2 to 3 higher, resulting in approximately 15% fewer usable trips. Response rates, the percentage of usable trips and the percent of item non-response for each question are provided in Table 3.

Table 2.3. Testing the Michigan Angler Survey: Trip Details. Comparison of survey Version 1 (reporting the details of the two most recent trip, n = 1,212) and Version 2 (most recent trip only n=1,238) survey response rate, item non-response and usable trip information.

| | Versi | Version 2 | | |
|------------------------------------|------------------------------|------------------------------|------------------------------|--|
| | Most Recent Trip | Second Most Recent Trip | Most Recent Trip | |
| Status | Perc | Percent | | |
| Survey Response Rate | 50.3% | | 51.2% | |
| Fished in last 12 months | 94.3 | 94.3% | | |
| Trip Characteristics | Percent Item Non-Response | Percent Item Non-Response | Percent Item Non-Response | |
| Date: Month | 12.8% | 27.5% | 12.9% | |
| Date: Year | 12.4% | 27.5% | 12.5% | |
| Fishing Main Purpose | 11.0% | 29.5% | 8.9% | |
| Overnight Trip | 11.0% | 28.7% | 8.4% | |
| Days Fished on Trip | 17.5% | 37.3% | 16.4% | |
| Multiple Rivers or Lakes | 11.2% | 29.4% | 8.4% | |
| Trip Location | Percent Item Non-Response | Percent Item Non-Response | Percent Item Non-Response | |
| River or Lake | 9.4% | 27.7% | 8.4% | |
| Name of River or Lake | 25.5% | 40.7% | 23.6% | |
| Nearest city/town/village | 15.3% | 32.6% | 12.3% | |
| County | 35.5% | 50.1% | 29.4% | |
| Primary Fishing Mode | 7.6% | 26.7% | 7.1% | |
| Fish Targeted, Caught, Released | 9.0% | 28.1% | 6.8% | |
| Usable Trip Information | 70.2% | 55.7% | 71.2% | |

Testing Personalization and Materials

For the test of personalization and material, we use data from the sample drawn on September 8, 2008. The simple random sample of licensed anglers drawn from the MDNR Retail Sales System included 4,837 Michigan residents, or 80.7% of the random sample drawn. Non-residents from Illinois, Indiana, Wisconsin, and Ohio comprised 3.7%, 3.5%, 3.1% and 3.0% of the simple random sample drawn, respectively.

The mean age of respondents and proportion of female respondents was slightly higher than our original simple random sample, while the proportion of Michigan residents was nearly identical (Table 4). Resident restricted licensees and 24 hour licensees comprised a slightly lower proportion of respondents, with the remaining license types (Resident All Species; Non-resident Restricted, Non-resident All Species, Senior Restricted, Senior All Species) comprising slightly larger proportions (Table 4).

| Respondent characteristics comparison. N = 2,732. | | | | |
|---|-------------|-------------|--|--|
| | MDNR Sample | Respondents | | |
| Michigan Residents | 80.7% | 80.8% | | |
| Non-Residents | 19.3% | 19.2% | | |
| Females | 20.8% | 22.2% | | |
| Mean Age | 45.34 | 49.76 | | |
| Standard Deviation (Age) | 15.96 | 15.79 | | |
| Resident Restricted | 43.3% | 37.6% | | |
| Resident All Species | 23.6% | 25.8% | | |
| Non-Resident Restricted | 6.1% | 6.7% | | |
| Non-Resident All Species | 2.6% | 3.2% | | |
| Senior Restricted | 5.1% | 6.8% | | |
| Senior All Species | 5.0% | 7.5% | | |
| 24 hour | 12.4% | 10.8% | | |
| Other Licenses | 1.9% | 1.6% | | |

| Table 2.4. Testing personalization and materials. MDNR Sa | mple and |
|---|----------|
| Respondent characteristics comparison. N = 2,732. | |

Of the 5,991 surveys in our simple random sample, 2,732 were returned. A total of 3,051 surveys were not returned, 204 surveys were undeliverable and 4 individuals refused to participate for an overall response rate of 47% (Table 5).

| Table 2.5. Michigan Recreational Angler Survey. Personalization and |
|--|
| Materials. Initial record checks eliminated (9); NCOA Undeliverable: |
| NCOA address check "No Forward" and "Primary Address Unverified |
| (12); Packages returned by USPS as undeliverable (192); Refusals (4); |
| Deceased (0); Surveys returned (2731); Surveys not returned (3052). |

| Status | Number | Percent | |
|----------------------|--------|---------|--|
| Response Rate | 47.14% | | |
| Initially Eliminated | 9 | 0.15% | |
| NCOA Undeliverable | 12 | 0.20% | |
| USPS Undeliverable | 192 | 3.20% | |
| Refusals | 4 | 0.07% | |
| Deceased | 0 | 0.00% | |
| Surveys Returned | 2732 | 45.53% | |
| Surveys Not Returned | 3051 | 50.85% | |
| TOTAL | 6000 | 100.00% | |

Recipients of the highest quality materials, printed envelopes and hand signed letters and postcards produced a 48% response rate, the same response rate for the electronically signed surveys (row 8, Table 6). Recipients of the lower quality materials, windowed envelopes and hand singed letters and postcards, produced a slightly lower response rate (46%) than those who received electronically signed surveys (row 8, Table 6). We determined there was no statistically significant difference between response rates for our four survey instruments (chi-square with three degrees of freedom = 1.593, p = 0.661).

Response rates and estimated survey costs of producing the 4 different treatments are provided in Table 6. The higher quality materials included a heavy bond paper survey, watermarked cover letters and watermarked envelopes with a printed address. The lower quality materials included a lighter bond paper survey, un-watermarked cover letters and un-watermarked windowed envelopes. The cost difference between high and low quality materials was approximately \$0.25 per package. Hand signing cover letters and postcards resulted in a cost difference of approximately \$0.06 per package. [It is important to note that the additional costs of hand signing reflect only the labor costs associated with signing (i.e. hourly student labor), and does not reflect costs related to additional management (e.g. trips made to retrieve printed packages, organizing labor employees and returning signed packages for mailing).] These production costs in Table 6 also reflect outgoing postage for letters (.42) and postcards (.28) (row 1 and row 5). The estimated total production costs for the entire field period for each of the 4 survey packages are provided in Table 6 (row 6). These costs reflect differences in materials and hand signing versus electronic signature as well as initial response rates (discussed below).

To determine the effects of survey packaging, personalization and materials on initial response rates, we examined our response rates for each of the 4 treatments at a point 17 days following the initial receipt of the survey package (Table 6). For our field period, this point reflects the end of the Wave 1 field period. At this point, initial response rates are determined and replacement materials and packaging are prepared for Wave 2. After 17 field days, the estimated survey costs associated with producing the 4 different treatments are provided in (row 2, Table 6). The total production costs in row 2 reflect the reduced field period and therefore a reduced number of mailings relative to the complete survey efforts. Given the higher initial response rates (row 4), the hand signed materials produce a relatively lower cost per usable survey than electronically signed survey packages (row 3). Further, the costs per usable survey for higher quality materials are also now comparable to lower quality materials (row 3). Response rates at this point in time were significantly different (chi-square with three degrees of freedom = 13.906, p

= 0.003) (Table 6). However, our final response rates (row 8), which reflects the full survey period and subsequent mailings, demonstrate that the effects of survey packaging, personalization and materials produced only minor differences in final response rate that were not statistically significant. Moreover, after all waves of the survey are considered, the lower quality, digitally signed materials have the lowest overall cost per usable survey (row 7).

Table 2.6. Testing Personalization and Materials. Unit costs include: materials to produce survey package(s) (mailing envelope, business return envelope, cover letter and survey instrument); follow-up postcard(s); labor involved in hand signing cover letters and postcards; and, finally outgoing postage. Total Production Costs reflects the Unit costs multiplied by the total number of mailings required over Wave 1 and Complete Survey. Cost per usable survey is calculated by dividing the Total Production Costs by the number of returned surveys.

| | Higher Quality Hand Signed | Higher Quality Digital Signature | Lower Quality Hand Signed | Lower Quality Digital Signature |
|--|----------------------------------|--|------------------------------|------------------------------------|
| Status | Cost: Wave 1 | Cost: Wave 1 | Cost: Wave 1 | Cost: Wave 1 |
| Unit Costs [materials; labor; outgoing postage] | \$2.73 | \$2.66 | \$2.47 | \$2.41 |
| Total Production Costs [Unit Cost x number of mailings] | \$3,041.69 | \$2,945.43 | \$2,633.36 | \$2,567.78 |
| Cost per usable survey [Total Production Cost / Returned Surveys] | \$8.10 | \$9.82 | \$8.07 | \$8.56 |
| Response Rate | 25.02% | 20.12% | 22.15% | 20.04% |
| Status | Costs: Complete Survey | Costs: Complete Survey | Costs: Complete Survey | Costs: Complete Survey |
| Unit Costs [materials; labor; outgoing postage] | \$2.73 | \$2.66 | \$2.47 | \$2.41 |
| Total Production Costs [Unit Cost x number of mailings] | \$5,232.14 | \$5,161.18 | \$4,639.22 | \$4,507.86 |
| Cost per usable survey [Total Production Cost / Returned Surveys] | \$7.53 | \$7.46 | \$6.96 | \$6.68 |
| Response Rate | 47.80% | 48.06% | 46.03% | 46.75% |

DISCUSSION

Decades of survey research and the human dimensions literature provide extensive information on the advantages and disadvantages of most survey designs. The mail survey design met our needs for a cost-effective survey mechanism to collect statewide angler behavior and demographic information from a broad spectrum of Michigan's recreational anglers. The opportunity to utilize the existing MDNR Retail Sales System to acquire angler contact information and additional demographic information from licensed anglers, and a history of mail surveys being implemented within the MDNR were also driving factors in our decision.

For maximum response rate, the Tailored Design Method, Dillman (2007) includes a 5-contact mailing strategy over an 8 week field period and among other design features, the use of incentives. Given our design to conduct monthly surveys and minimize recall, we did not include pre-notices and incentives and implemented a 4contact mailing strategy which included two postcard reminders and only one replacement questionnaire over a shortened 6 week field period.

Given this survey strategy, our response rates ranged between 46% and 51%. While older literature suggests that response rates of 60 to 75% may be expected, (Brown 1991), response rates for similar studies are comparable to ours given our reduced number of contacts (Kikuchi 1986; McClanahan and Hansen (2003); Hutt and Bettoli (2007); Connelly et al. (2001)).

In his application of the theory of social exchange, Dillman (2007) emphasizes minimizing respondent's perceived costs by reducing inconvenience and making questions appear short and easy. Other researchers have also emphasized the importance of survey instruments that do not unduly burden respondents (Pollock et al. 1994; Biemer and Lyberg pg124, pg135). Further, survey instruments with relatively fewer and more interesting questions may also decrease item-nonresponse (Dillman 2007 pg 79-148). Dillman (2007) cautions that the matrix format, such as the one we employed to collect information on the most recent and second most recent fishing trips may result in lower response rate and higher item-nonresponse. In this matrix format, the navigational path used in the balance of the survey is temporarily abandoned and respondents must relate rows to columns, which may be more complicated than reading and answering individual questions (Dillman 2007).

Given the relative high occurrence of item-nonresponse for the second trip in the two-trip survey version, the information sought on the two most recent trips may have proven burdensome for some anglers. However the majority of respondents provided usable information in this section, suggesting anglers are able to recall and report on this information. Further, there is no additional cost to including a space for collecting information on the most recent and second most recent fishing trip, which provided us with substantially more data without significant loss to the quality of data for the most recent fishing trip question. While improvements may be made to restore the navigational path present in the survey, collecting information on the two most recent trips provides valuable information on the interval between fishing trips and a wealth of information on angler trip behavior and provides information for economic analysis.

So that each letter is an individual appeal to each respondent, Dillman (2007) recommends each letter to be individually signed whenever possible. A "pressed blue ball-point pen signature" was described in the Total Design Method, Dillman (2000). A

substitute for this is to preprint the signature in a color (blue) that contrasts with the black type, using a signature stamp or signature machine Dillman (2007).

Given our approximately 1% difference in response rate, we contend that, given other aspects of personalization (using individual names and letterhead), hand signing may not be worth the additional costs for similar angler surveys. Likewise, the costs of higher quality materials did not produce significant increases in response rate. However, our findings of higher initial response for higher quality and hand signed survey packages suggest a faster turn-around time for these packages. Researchers who plan limited contacts may consider using higher quality materials and personalizing letters.

CHAPTER 3: Profile of Michigan's Recreational Anglers: The Michigan Recreational Angler Survey

BACKGROUND AND RATIONALE

Previous fisheries management strategies often treated anglers as a homogeneous group, as agencies formulated policies to suit the "average angler" (Fisher 1997), often oversimplifying the effects of people in fisheries management (Hutt and Bettoli 2007). A rich body of literature now exists to support the concept of angler populations as a collection of heterogeneous subgroups (e.g., Bryan (1977); Chipman and Helfrich (1988); Fisher (1997); Finn and Loomis (2001); Hunt et al. (2002); Sutton (2003); Kyle et al. (2007); Anderson et al. (2007); Hutt and Bettoli (2007)). Anglers seek different kinds of fishing experiences, and no one site or management strategy is likely to satisfy all angler subgroups (Connelly et al. 2001). Information about the number, size and desires of angler subgroups provides fisheries managers with the information necessary to offer a variety of experiences and implement rules and regulations with predictive knowledge of which groups will be effected (Fisher 1997). Faced with multiple management options to achieve the same biological outcome, managers may design rules and regulations inclusive of the motives and preferences of angler subgroups that dominate the angler constituency at particular waterbodies (Hutt and Bettoli 2007). The challenge to researchers has been to identify and quantify the different angler segments to help managers estimate the relative demand for different types of opportunities (Fisher 1997).

The Michigan Department of Natural Resources has been credited as one of the first states to initiate statewide mail angler surveys to collect biological and user profile data in the Great Lakes system (Brown 1987). These surveys have helped to determine angler's state-wide pattern of fishery resource use (Jamsen 1985a and 1985b; Mahoney et al. 1991). Examples of the type of information collected during these surveys included: total angler effort, spatial and temporal distribution of angling effort, and spatial distribution of catch by species (but not for site-specific harvest). However, these surveys were discontinued in the mid 1980's. Since that time the MDNR Fisheries Division has conducted only occasional human dimensions surveys to support individual projects or to react to management issues. This approach has left the MDNR Fisheries Division with uncoordinated angler human dimensions data collection efforts being undertaken as separate projects over time (Lupi et al. 2005).

In his typology of Great Lakes sport-fisheries human dimensions needs, Brown (1987) emphasized the importance of developing basic angler user profiles as a first and elementary step in fisheries management. The Michigan Recreational Angler survey is designed to collect critical information on the status and distribution of angling effort for all of Michigan's fisheries, tracking the status of Michigan's recreational anglers and their resource use including behaviors, spatial distribution, trip characteristics and data for economic analysis. One of the objectives of this study was to begin the process of developing accurate and reliable profiles of Michigan's licensed recreational anglers, with a focus on relating demographic characteristics of anglers and their fishing behavior. Our survey collected various aspects of angler behavioral and demographic information previously identified in the literature as measures to describe angler groups. Prior angler

specialization research, the 2006 U.S. Fish and Wildlife Service National Survey of Fishing, Hunting and Wildlife Associated Recreation, and previous surveys of Michigan's anglers (Lupi et al. 2005; Kukuchi 1986, Jamsen 1985a and 1985b) guide our discussion below.

METHODS

Questionnaire Development

The survey instrument was initially drafted following a review of published literature, a collection of U.S. fisheries management agency survey instruments and survey reports (Simoes, et al. www.msu.edu/~lupi/anglers.html) and related angler survey documents and needs assessment materials developed by the MDNR, the MDNR Fisheries Division and their research and management partners.

Two rounds of "think-aloud" cognitive interviews as well as "retrospective interviews" were conducted with peers and licensed angler acquaintances to initially assess or "pretest" the survey questionnaire. Techniques and probing questions for a series of cognitive interviews conducted during the spring and summer of 2008 were modified for our specific purposes following Dillman (2007).

Questionnaire

Our mailing strategy follows many of the principles outlined by Dillman (2007) with multiple follow-ups, personalized mailings, and progressively urgent appeals in an effort to increase response rate and reduce nonresponse bias (Pollock 1994 pg 80). Our mail survey instrument collects both short term and longer term trip information in order to balance the benefits of long recall periods with the needs for accuracy, to capture

angling seasonality, to cover a larger geographical area and to incur low costs per respondent.

To meet our objectives, the survey instrument contains 20 to 21 multi-part questions over four major sections: Part A) general fishing activities during the last 12 months; Part B) fishing activities during the most recent month (e.g., July, August); Part C) details of the recent fishing trip(s); Part D) usual fishing activities, background and demographic information (Appendix B #1 and Appendix B #2). We anticipated a large number of respondents will not have fished either in the last 12 months, or in July or August which necessitated our large sample sizes. Analysis based on fishing behavior (e.g., frequency, catch disposition; waterbodies fished, fishing mode), license type, and other demographic information also required larger sample sizes for robust analysis.

We examined several variables to test relationships between aspects of fishing behavior thought to be important attributes of angler subgroups (fishing frequency; waterbodies fished; catch disposition; age of introduction to fishing) and various socioeconomic characteristics. Survey respondents were asked if they had fished in the last 12 months in Michigan, and those that had were then asked to report how many times in the last 12 months they had gone fishing in Michigan by choosing one of 6 categories. Survey respondents were also asked to indicate which waterbodies they fished in Michigan in the last 12 months. Anglers choose all that applied from the 3 classes of waterbodies presented (Michigan rivers; Michigan inland lakes; Great Lakes and connecting waterways). Due to the nature of this question, waterbody percentages do not add up to 100%. We created 7 distinct waterbody categories from our original 3 waterbody categories to examine angler groups who specialize only on one water body,

on only two waterbodies and anglers that fish on all three waterbodies. All survey respondents, whether or not they reported they had fished in the last 12 months, were asked to indicate what they usually do with the legal size fish they catch (mostly keep my catch; keep some, release some; mostly catch and release). All survey respondents were also asked to indicate their age the first time they went fishing. We grouped the ages provided by respondents into 7 age categories.

To determine whether associations existed between categorical variables (demographic data and angler behavior) we used SPSS Statistics 17.0® "crosstabs" and calculated the significance level (*p*-value) for Pearson chi-square test of independence. We also conducted F tests for continuous data, comparing means across categories.

Sampling Frame

Our sample frame was the MDNR Retail Sales System database. MDNR recreational angler licenses are effective April 1, 2008 through March 31, 2009 for the 2008-2009 fishing season (however anglers may purchase licenses during the month of March for the following season). In order to sample licensed anglers from the current license year and reduce printing and administrative costs, a simple random sample of 5,000 individuals who purchased fishing licenses between April 1, 2008 and July 31, 2008 was drawn on August 27, 2008. A second random sample of 6,000 individuals who purchased fishing licenses between April 1, 2008 was drawn on September 8, 2008. Each sample included all possible license types.

Data from the MDNR Retail Sales System was examined and entries missing key information (e.g., name of licensee, address of licensee) were deleted. Data with
extraneous information was edited for correctness, where possible, or deleted. Licensees with addresses outside the U.S. or Canada were also removed from the sample. Once the final sample was established, each licensee in the sample was assigned a unique project code which was used for the duration of the project. MSU's, University Relations Printing Services was contracted to conduct a National Change of Address (NCOA) check of licensees, conduct a mail merge, print and package all components of the mailings and apply the appropriate postage to all mailings. The completed packages were then pre-sorted and mailed First-Class through the United States Postal Service. Each business reply envelope contained the unique project code assigned to each individual in our sample.

Data Collection Procedures

The procedures for this mail survey were adapted from on the methods in *Mail* and Internet Surveys (Dillman 2007). The first mailing included: 1) a cover letter printed on MSU letterhead explaining the importance and objectives of the survey; 2) the four page survey instrument; and, 3) a self-addressed, postage paid, business reply envelope. The first mailing was followed 5 to 7 days later by a reminder / thank you postcard. Approximately 33 days after the first mailing, non-respondents received a third mailing containing: 1) a second cover letter printed on MSU letterhead which again explained the importance and objectives of the survey with a slightly more urgent appeal; 2) a replacement survey instrument; and, 3) a self-addressed, postage paid, business reply envelope. Approximately 11 days after the third mailing, non-respondents received a fourth and final reminder / thank you postcard with a slightly more urgent appeal.

Examples of surveys and cover letters used in the mailing sequence can be found in Appendix B and Appendix C.

Returned business reply envelopes and undeliverable mailings were grouped by the week of their receipt. All returned mailings were coded to inform follow-up mailings. Additional communications from respondents directed to the principal investigator including short notes, letters, pictures and refusals were coded and filed appropriately. Returning business reply envelopes were opened and the project code appearing on the business reply envelope was written on the top of the corresponding survey. Surveys returning in envelopes other than the business reply envelope were examined for evidence of the sender. The majority of these envelopes contained a return address which could be linked through a separate database to the intended recipient and the project identification code. Five surveys were unidentifiable because they were returned in nonproject envelopes, without an indication of the sender.

Survey data were entered by technicians. Surveys with unusual response patters and inconsistencies were identified for further review. Consistent rules were established for measuring usable response (Dillman 2007 pg 9) (e.g. skipped questions and dual responses when single-answer responses were sought). Final editing and quality control were overseen by one individual who is familiar with the survey instrument and the purpose of the research. The data management process was concluded by merging double-keyed files to detect for differences in data entry.

Our simple random sample was drawn on two occasions from the Michigan Department of Natural Resources Retail Sales System (August 27, 2008 and September 8, 2008) and includes only those anglers who had purchased a Michigan recreational

angler license on or before August 31, 2008. Further, because Michigan does not require anglers under the age of 16 to purchase a fishing license to fish in the state of Michigan, this age group is likely under-represented in our sample. Finally, most survey items refer to fishing activities occurring in Michigan.

RESULTS

Of the 10,986 individuals who were contacted from our simple random sample, 5,182 individuals returned surveys. A total of 5,422 surveys were not returned, 373 surveys were undeliverable, 7 individuals refused to participate and 1 was reported deceased, for a response rate of 49% (Table 1). Specific details pertaining to mailing dates and rate of return by field week can be found in Appendix D#1 and D#2.

| Table 3.1 . Michigan Recreation [11,000 - (22 +352+1) / 5182] | onal Angler Survey 49% | . Response rate: |
|--|---------------------------|------------------|
| Status | Number | Percent |
| Initially Eliminated | 14 | 0.13% |
| NCOA Undeliverable | 22 | 0.20% |
| USPS Undeliverable | 351 | 3.19% |
| Refusals | 7 | 0.06% |
| Deceased | 1 | 0.01% |
| Surveys Returned | 5182 | 47.11% |
| Surveys Not Returned | 5422 | 49.30% |
| TOTAL | 10999 | 100.00% |

Sample Draw, Respondent and Non-Respondent Characteristics

Our simple random sample of licensed anglers drawn from the MDNR Retail Sales System included 8,989 Michigan residents, or 81.8% of the random sample drawn. Non-residents from Illinois, Indiana, Wisconsin and Ohio comprised 3.6%, 3.4%, 2.9% and 2.8% of the simple random sample drawn, respectively. We compare the characteristics of our respondents to non-respondents and to our original random sample in Table 1.

The proportion of female respondents was significantly larger than nonrespondents (chi-square with one degree of freedom = 6.872, p = 0.009). The mean age of respondents was significantly higher than non-respondents (p < 0.001). A smaller proportion of resident restricted licensees and 24 hour licensees responded to our survey, with the remaining commonly issued license types (Resident All Species; Non-resident Restricted, Non-resident All Species, Senior Restricted, Senior All Species) comprising a slightly larger proportion of our respondents (chi-square with 8 degrees of freedom =322.415, p < 0.001) (Table 2).

| | MDNR Sample | Respondents | Non-Respondents |
|--------------------------|-------------|-------------|-----------------|
| Michigan Residents | 81.8% | 82.0% | 82.9% |
| Non-Residents | 18.2% | 18.0% | 17.1% |
| Females | 20.9% | 22.0% | 19.9%* |
| Mean Age | 45.34 | 49.81 | 41.54* |
| Standard Deviation (Age) | 16.008 | 15.785 | 15.122 |
| License Type* | | | |
| Resident Restricted | 43.8% | 38.0% | 49.5% |
| Resident All Species | 24.9% | 27.0% | 23.6% |
| Non-Resident Restricted | 5.9% | 6.5% | 5.1% |
| Non-Resident All Species | 2.5% | 3.2% | 1.9% |
| Senior Restricted | 5.0% | 6.8% | 3.6% |
| Senior All Species | 5.1% | 7.6% | 2.9% |
| 24 hour | 11.1% | 9.4% | 11.7% |
| Other Licenses | 1.7% | 1.5% | 1.7% |

Table 3.2. MDNR Sample, Respondent and Non-Respondent characteristics comparison. A total of 10,986 individuals were contacted, n = 5,182. * p < .05

Respondent Demographic Characteristics

Males comprised over three-quarters (78%) of our respondent demographic, with eighty-eight percent of survey respondents reporting they were White, non-Hispanic. Over half of our respondents reported working fulltime and reported incomes between \$25,000 and 74,999 (55% and 52% respectively) with the majority of respondents (64%) reporting either a High School degree or GED or Some post High School or some college. Over three-quarters of respondents (77%) reported living with a spouse or significant other, 36% reported living with children age 5 and under and/or children age 6 to 17. Finally, 74% of respondents reported they used a computer to access the internet for personal use (Table 3).

| | Residents | Non-Residents | All Respondents | | | |
|--|-----------|---------------|-----------------|--|--|--|
| Females | 22.2% | 20.7% | 22.0% | | | |
| Mean Age | 49.65 | 50.55 | 49.81 | | | |
| License Type | | | | | | |
| Resident Restricted | 46.2% | 0.6% | 38.0% | | | |
| Resident All Species | 32.9% | 0.2% | 27.0% | | | |
| Non-Resident Restricted | 0.0% | 36.3% | 6.5% | | | |
| Non-Resident All Species | 0.0% | 17.5% | 3.2% | | | |
| Senior Restricted | 8.3% | 0.0% | 6.8% | | | |
| Senior All Species | 9.3% | 0.1% | 7.6% | | | |
| 24 hour | 1.6% | 45.0% | 9.4% | | | |
| Other Licenses | 1.7% | 0.3% | 1.5% | | | |
| Employment Category | | | | | | |
| Employed fulltime | 53.6% | 63.9% | 55.4% | | | |
| Part-time | 7.4% | 6.4% | 7.2% | | | |
| Retired | 28.1% | 23.5% | 27.3% | | | |
| Un-employed | 5.9% | 2.2% | 5.3% | | | |
| Other | 5.0% | 4.1% | 4.9% | | | |
| Income Category | | | | | | |
| 0 - 24,999 | 17.7% | 7.9% | 15.9% | | | |
| 25,000 - 49,000 | 29.4% | 19.1% | 27.5% | | | |
| 50,000 - 74,999 | 24.4% | 24.1% | 24.3% | | | |
| 75,000 to 99,999 | 13.5% | 18.7% | 14.4% | | | |
| 100, 000 to 149,999 | 10.0% | 17.4% | 11.3% | | | |
| 150,000 or more | 5.2% | 12.8% | 6.5% | | | |
| Education Category | | | | | | |
| Less than High School degree | 6.2% | 2.6% | 5.6% | | | |
| High School degree or GED | 27.8% | 19.6% | 26.3% | | | |
| Some post High School or some college | 38.3% | 32.3% | 37.2% | | | |
| Bachelor's Degree | 17.3% | 27.7% | 19.2% | | | |
| Graduate Degree | 10.3% | 17.8% | 11.7% | | | |
| Household Structure | | | | | | |
| Spouse | 76.3% | 81.3% | 77.2% | | | |
| Children < 5 | 10.6% | 8.8% | 10.3% | | | |
| Children 6 to 17 | 26.0% | 25.9% | 25.9% | | | |
| Other immediate family | 17.3% | 12.7% | 16.4% | | | |
| Extended family or other adults | 5.9% | 3.9% | 5.6% | | | |
| None of these | 11.0% | 11.4% | 11.1% | | | |
| Number of licensees | | | | | | |
| 1 (only respondent) | 53.0% | 51.9% | 52.8% | | | |
| 2 | 38.2% | 39.6% | 38.5% | | | |
| 3 or more | 8.9% | 8.5% | 8.7% | | | |
| Internet access (Yes) | 71.7% | 82.4% | 73.6% | | | |

Table 3.3. Comparison of Michigan residents and non-residents and the total sample: gender ratio, mean age, license types, employment, education and income categories, household structure and the number of household members with a fishing license (including the respondent) and internet access. The 2006 U.S. Fish and Wildlife Service National Survey of Fishing, Hunting and Wildlife Associated Recreation (NSFHWAR) screening sample for Michigan consisted of 1,035 eligible housing units and obtained 942 interviews from these units. Surveys are conducted of households and survey respondents are not necessarily licensed recreational anglers. Some of the variables reported in the NSFHWAR study are estimates based on sample sizes of 10 to 29 observations. Our survey sample exceeds that of NSFHWAR by a factor of five. Compared to the findings from NSFHWAR, a larger proportion of our resident respondents reported household incomes of \$0 to 49,000, were 45 years of age and older, and reported some post High School or some college, were college educated or held advanced degrees (Table 4).

| Survey. # Age category | not reported. | | | | |
|-------------------------|--------------------------|--------------------------|------------|--------------------------|--|
| N | ISFHWAR | | 2008 MI A | ngler Survey | |
| Income Category | me Category Percentage P | | Percentage | Cumulative Percentage | |
| \$0 to 49,999 | 28.0% | 28.0% | 41.1% | 41.1% | |
| \$50,000 to 74,999 | 19.0% | 47.0% | 21.3% | 62.4% | |
| \$75, 000 to 99,999 | 13.0% | 60.0% | 11.8% | 74.2% | |
| 100,000 or more | 16.0% | 76.0% | 13.2% | 87.4% | |
| Item Non Response | 17.0% | 93.0% | 12.3% | 99.7% | |
| Age Category | Percentage | Cumulative Percentage | Percentage | Cumulative Percentage | |
| Under age 16 | # | # | 0.3% | # | |
| 16 to 17 | 7.0% | 7.0% | 0.7% | 0.7% | |
| 18 to 24 | 8.0% | 15.0% | 6.4% | 7.1% | |
| 25 to 34 | 17.0% | 32.0% | 12.6% | 19.7% | |
| 35 to 44 | 26.0% | 58.0% | 16.0% | 35.7% | |
| 45 to 54 | 15.0% | 73.0% | 23.3% | 59.0% | |
| 55 to 64 | 19.0% | 92.0% | 21.9% | 80.9% | |
| 65 and older | 9.0% | 101.0% | 18.9% | 99.8% | |
| Education Category | Percentage | Cumulative Percentage | Percentage | Cumulative Percentage | |
| 11 years or less | 19.0% | 19.0% | 6.2% | 6.2% | |
| 12 years | 29.0% | 48.0% | 27.8% | 34.0% | |
| 1 to 3 years of college | 24.0% | 72.0% | 38.3% | 72.3% | |
| 4 years college or more | 29.0% | 101.0% | 27.6% | 99.9% | |

Table 3.4. Comparison of Michigan resident reported income and age and education categories between the 2006 U.S. Fish and Wildlife Service National Survey of Fishing, Hunting and Wildlife Associated Recreation (NSFHWAR) and respondents to the 2008 Michigan Recreational Angler Survey. # Age category not reported.

Kikuchi (1986) conducted a mail survey of resident and non-resident license holders in 1984. A total of 44,000 questionnaires were mailed on five different dates during the year, achieving a 57% response rate. Compared to the findings of Kikuchi (1986) we report larger percentages for many race and ethnic categories, with a slightly lower percentage of our respondents reporting as Black or African American (Table 5).

Table 3.5. Comparison of Michigan resident reported race and ethnicity categories between the Kikuchi (1984) and respondents to the 2008 Michigan Recreational Angler Survey. Our respondents were allowed to choose all race or ethnicity categories that applied. Kikuchi (1984) reported 8.9% "mixed races". # = category not reported.

| | Kikuchi (1984) | 2008 MI Angler Survey |
|--|----------------|--------------------------|
| Race and Ethnicity | Percentage | Percentage |
| Asian | 0.1% | 0.9% |
| American Indian or Alaskan Native | 0.2% | 1.6% |
| Black or African American | 2.6% | 2.4% |
| Native Hawaiian or Pacific Islander | # | 0.3% |
| Hispanic, Latino or Spanish Origin | 0.5% | 1.2% |
| White, non-Hispanic | 88.0% | 94.4% |
| Other | 8.9% | 1.1% |

Respondent Fishing Characteristics

We examined 7 commonly issued license types, 6 of which could be broadly categorized as either "restricted" licenses (all species except trout and salmon) or "all species" licenses (all fish species, including trout and salmon). License types are further defined as Resident, Non-resident and Senior license types. Finally we also examined 24 hour licenses holders which may be purchased by residents or non-residents, which allow anglers to fish for all species including trout and salmon and are valid for one 24 hour period. The remaining license types issued by the MDNR, identified in our study as "other licenses", comprise less then 2% of our sample. Resident Restricted and Resident All Species licensees comprised the largest proportion of our respondent demographic (38% and 27%, respectively).

On average, respondents began fishing when they were 7.5 years old and had fished in Michigan for 33 years. Fifty-three percent of respondents reported they were the only license holder in their household, while 39% lived in households in which one other person held a current fishing license. The majority of anglers (60%) reported they usually fished with family or relatives, and most owned a boat or canoe used for fishing (61.5%). A very small percentage, (5.4%) of anglers reported they had competed in fishing events in Michigan in the last 12 months. Respondents were only slightly more likely to report they usually keep some and release some of the legal size fish they catch than mostly keeping their catch or mostly practicing catch and release.

Ninety-six percent of respondents reported they had fished in Michigan in the past 12 months. The majority of anglers (57%) reported fishing 6 or more times in the last 12 months. Seventy-seven percent of respondents indicated that they had fished in inland lakes in the last 12 months. When examining 7 combinations of these waterbodies, we found the largest group of anglers reported fishing exclusively at inland lakes (34%), followed by anglers who fished all waterbodies (16%) and anglers who fished both rivers and inland lakes (16%). Finally, 29% of respondents reported they had fished in other states or other countries besides Michigan (Table 6).

| able 5.0. Comparison of Michigan resi | | | |
|---------------------------------------|---------------|--------------|---------------|
| | Kesident | Non-Kesident | Combined |
| Age first went fishing | | | |
| Mean age | 6.10 | 7.91 | 7.5 years old |
| Range | 0 to 82 | 1 to 80 | 0 to 82 years |
| Standard deviation | 6.811 | 8.540 | 7.157 years |
| Fishing in Michigan | | | |
| Mean years | 29.9 years | 18.7 years | 33 years |
| Range | 0 to 83 years | 0 to 75 | 0 to 83 years |
| Standard deviation | 17.648 | 17.836 | 18.932 |
| Who usually fish with | | | |
| No one else | 7.7% | 6.1% | 7.4% |
| Family / relatives | 59.5% | 61.7% | 60.0% |
| Friends | 30.8% | 30.8% | 30.8% |
| Other | 0.2% | 1.3% | 1.9% |
| Boat ownership | | . | |
| Yes | 62.7% | 56.0% | 61.5% |
| Motor boat | 52.4% | 47.8% | 51.5% |
| Canoe / kayak | 14.8% | 13.3% | 14.5% |
| Disposition of catch | L | L | ···· |
| Mostly keep my catch | 32.5% | 24.4% | 31.0% |
| Keep some, release some | 36.0% | 33.6% | 35.6% |
| Mostly catch and release | 31.5% | 42.0% | 33.4% |
| Competition in MI Fishing Events | 6.2% | 2.1% | 5.4% |
| Fished in last 12 months | 95.7% | 96.7% | 95.9% |
| 0 times | 3.9% | 2.4% | 3.6% |
| 1 time | 4.7% | 23.8% | 8.1% |
| 2 or 3 times | 13.2% | 27.0% | 15.6% |
| 4 or 5 times | 14.2% | 17.8% | 14.8% |
| 6 to 9 times | 14.7% | 13.0% | 14.4% |
| 10 to 19 times | 18.5% | 8.4% | 16.7% |
| 20 or more times | 30.8% | 7.6% | 26.7% |
| Waterbodies fished | | | |
| Michigan Rivers | 47.3% | 26.7% | 43.6% |
| Michigan Inland Lakes | 78.7% | 68.0% | 76.8% |
| Great Lakes and connecting waterways | 44.4% | 32.2% | 42.2% |
| Waterbodies fished | | | |
| Great Lakes and connecting waterways | 10.80/ | 17 20/ | 12.0% |
| (exclusive) | 10.070 | 17.370 | 12.070 |
| Inland Lakes (exclusive) | 31.0% | 48.6% | 34.2% |
| Inland Lakes and Great Lakes | 10.9% | 7.3% | 10.2% |
| Rivers (exclusive) | 6.8% | 11.2% | 7.6% |
| Rivers and Great Lakes | 3.7% | 3.4% | 3.6% |
| Rivers and Inland Lakes | 17.8% | 8.0% | 16.0% |
| All Waterbodies | 19.0% | 4.1% | 16.3% |
| Fishing Outside of Michigan or U.S. | 20.1% | 68.5% | 28.9% |

Table 3.6. Comparison of Michigan residents and non-residents and the total sample: fishing behavior.

Jamsen (1985) conducted a mail survey of licensed anglers which was stratified with the aim of estimating angling in northern regions of the state. Spouses of resident anglers and anglers under the age of 17 were not included in this sample. Jamsen (1985) reported inland lake fishing accounted for 73% of the estimated 14.4 million angler days of inland fishing. Although Jamsen's figure is for the share of fishing effort and our figure is for the waterbodies fished (not adjusted for possible differences in effort), the figures for the share of inland fishing compare favorably.

Resident versus Non-resident Demographic Characteristics

We found a greater proportion of non-residents were employed fulltime, had household incomes of \$75,000 or greater, were college educated or held advanced degrees and were more likely to use a computer to access the internet for personal use. Similarly, Kikuchi (1986) reported that nonresident license holders were on average younger, with higher levels of education and higher incomes than resident anglers. We also compared our findings of resident and non-resident age categories to the findings of Kikuchi (1986) (Table 7). Larger proportions of both our resident and non-resident respondents were found in the oldest age categories, compared to the findings of Kikuchi (1986).

| | Res | ident | Non-l | Resident |
|--------------|-------|-------|-------|----------|
| Age Category | 1984 | 2008 | 1984 | 2008 |
| < 17 | # | 0.4% | # | 0.3% |
| 17 to 19 | 3.6% | 2.6% | 4.0% | 0.9% |
| 20 to 24 | 8.5% | 4.4% | 8.4% | 4.1% |
| 25 to 29 | 12.1% | 6.0% | 12.3% | 5.5% |
| 30 to 34 | 14.6% | 6.6% | 14.7% | 5.5% |
| 35 to 39 | 11.0% | 7.1% | 15.7% | 6.6% |
| 40 to 44 | 8.3% | 8.9% | 7.3% | 9.2% |
| 45 to 49 | 8.0% | 11.3% | 8.2% | 12.4% |
| 50 to 54 | 7.1% | 12.0% | 3.3% | 14.0% |
| 55 to 59 | 7.4% | 11.9% | 10.0% | 12.1% |
| 60 to 64 | 7.0% | 10.0% | 6.3% | 11.0% |
| 65 to 69 | 7.6% | 8.3% | 5.2% | 9.4% |
| 70 plus | 4.8% | 10.5% | 4.6% | 8.9% |

Table 3.7. Comparison of reported age and education categories for residents and non-residents to Kikuchi (1984). #- category not collected.

Jamsen (1967) reported on sex and age structure of resident and nonresident licensed anglers, (which excluded residents under the age of 17, wives of licensed residents, members of the Armed Services on furlough, and those who fished on the Great Lakes and Saginaw River), using fishing license packets voluntarily returned to the department. Given these caveats, we compared our findings of resident and non-resident age categories to those reported by Jamsen (1967). As with the findings of Kikuchi (1984) larger proportions of both our resident and non-resident respondents were found in the oldest age categories, compared to those reported by Jamsen (1967) (Table 8).

| | | | Resident | | |
|--------------|-------|-------|------------|-------|-------|
| Age Category | 1962 | 1963 | 1964 | 1965 | 2008 |
| Less than 17 | # | # | # | # | 0.4% |
| 17 to 19 | 5.6% | 4.4% | 4.6% | 5.8% | 2.6% |
| 20 to 24 | 8.1% | 8.9% | 8.7% | 8.2% | 4.4% |
| 25 to 29 | 9.5% | 9.5% | 9.3% | 9.4% | 6.0% |
| 30 to 34 | 10.1% | 10.9% | 11.1% | 10.4% | 6.6% |
| 35 to 39 | 11.7% | 11.7% | 11.5% | 11.4% | 7.1% |
| 40 to 44 | 11.3% | 11.5% | 11.7% | 11.1% | 8.9% |
| 45 to 49 | 10.9% | 11.1% | 10.8% | 10.3% | 11.3% |
| 50 to 54 | 9.9% | 9.1% | 9.4% | 10.2% | 12.0% |
| 55 to 59 | 7.5% | 6.7% | 5.3% | 7.4% | 11.9% |
| 60 to 64 | 6.2% | 5.1% | 6.5% | 5.4% | 10.0% |
| 65 - over | 9.2% | 11.1% | 11.1% | 10.4% | 18.8% |
| Age Category | | | Non-Reside | ent | |
| Less than 17 | 0.1% | 0.0% | 0.0% | 0.0% | 0.3% |
| 17 to 19 | 4.1% | 3.5% | 3.4% | 3.8% | 0.9% |
| 20 to 24 | 5.3% | 5.8% | 5.5% | 6.6% | 4.1% |
| 25 to 29 | 9.5% | 8.4% | 8.9% | 8.7% | 5.5% |
| 30 to 34 | 10.6% | 10.2% | 10.3% | 10.3% | 5.5% |
| 35 to 39 | 14.5% | 13.0% | 13.1% | 13.4% | 6.6% |
| 40 to 44 | 13.4% | 14.0% | 13.3% | 13.8% | 9.2% |
| 45 to 49 | 11.1% | 12.9% | 12.9% | 11.4% | 12.4% |
| 50 to 54 | 9.3% | 10.0% | 11.5% | 10.6% | 14.0% |
| 55 to 59 | 8.4% | 8.7% | 8.1% | 8.5% | 12.1% |
| 60 to 64 | 6.4% | 6.3% | 5.9% | 4.7% | 11.0% |
| 65 - over | 7.3% | 7.2% | 7.1% | 8.2% | 18.3% |

Table 2.8 Companies of an and an anti-

Resident versus Non-Resident Fishing Characteristics

Due to the nature of the Michigan recreational licensing system, discussed above, we report differences between resident and non-residents in the purchasing of resident and non-resident license types (Table 3). Resident Restricted and Resident All Species licenses comprised the largest proportion of license types (38% and 27%, respectively). Non-resident license holders were more likely to purchase restricted licenses. Finally, 24 hour fishing licenses were much more likely to be purchased by non-residents than residents.

Non-residents were less likely to own a boat they use for fishing, were less likely to have competed in fishing events in Michigan in the last 12 months, were more likely to practice catch and release and less likely to report they keep the legal size fish they caught than residents anglers. Non-residents also fished less frequently than residents and were much more likely than residents to report fishing in other states or other countries besides Michigan, 69% and 20% respectively. Non-residents were more likely to be waterbody specialists, fishing exclusively on inland lakes, rivers or Great Lakes and connecting waterways, with nearly half (49%) of non-residents fishing exclusively on inland lakes. A much larger proportion of residents than non-residents reported fishing on all waterbodies (19%) and rivers *with* inland lakes (17%) (Table 6).

In our survey, 20.1% of Michigan residents reported fishing in other countries or other states besides Michigan, compared with 69% of non-residents. The U.S. Fish and Wildlife Service reported that 103,000 Michigan residents fished in other states, or 9% of all residents fishing in any state. Kikuchi (1986) reported that 24.1% of resident anglers fished out of state (Table 7).

License Type

Resident licenses (Resident Restricted and Resident All Species) were the largest license groups in our sample, 38% and 27% of all license holders respectively. Resident Restricted license holders and Resident All Species license holders were also more likely than any other license groups to report fishing 6 or more times in the last 12 months, 63% and 73%, respectively.

Senior license holders (Senior Restricted and Senior All Species) were the most likely license group to report they had not fished in the last 12 months (19%). Among Senior license holders, a larger proportion of Senior Restricted license holders reported fishing fewer than 5 times, (with more Senior All Species license holders reporting fishing 6 or more times). Further, twenty-seven percent of Senior All Species license holders reported fishing 20 or more times in the last 12 months, compared to 18% of Senior Restricted license holders.

Across all license types, a larger proportion of anglers reported fishing on inland lakes than on rivers or Great Lakes and connecting waterways. However (with the exception of 24 hour license holders), Resident All Species and Non-resident All Species license holders were less likely than other license groups to report fishing on inland lakes and were more likely to report fishing on rivers and Great Lakes and connecting waterways. Non-resident Restricted and Senior Restricted license holders were the least likely group to report fishing on rivers or Great Lakes and connecting waterways, and were the least-represented angler group on these waterbodies. Non-resident All Species license holders were three times more likely than Non-resident restricted license holders to report fishing on rivers, and twice as likely to fish on Great Lakes and connecting waterways.

When examining the seven mutually exclusive waterbody categories, across all license types, a larger proportion of anglers indicated that they fished exclusively on inland lakes, with the exception of Resident All Species license holders in which nearly one-third of license holders (32%) reported fishing on All waterbodies. Restricted license holders (Resident Restricted, Non-resident Restricted and Senior Restricted) were

2 to 3 times more likely to fish on inland lakes than their All Species counterparts (Resident All Species, Non-resident All Species and Senior All Species). The differences between Restricted license holders and All Species license holders were greatest for Non-Residents; Non-resident All Species license holders were 3 times less likely to fish exclusively at inland lakes and about 2 to 7 times more likely to fish the other combinations of waterbodies.

While the majority of license holders reported fishing before the age of 11, Senior license holders were more likely than any other license group to report they fished after the age of 10. Both Resident Restricted and Senior Restricted license holders were more likely than their All Species counterparts (Resident All Species and Senior All Species) to report they fished after the age of 10.

Senior license holders (Senior Restricted and Senior All Species) were more likely than any other license group to report they mostly keep the legal sized fish they catch, and were less likely to report they practiced catch and release. Non-resident All Species and 24 hour license holders were more likely than any other license group to report they mostly practiced catch and release. Non-resident Restricted and Non-resident All Species license holders were the least likely group to mostly keep their catch. Resident Restricted and Resident All Species license holders were similar in their catch disposition, though a larger proportion of Resident Restricted license holders reported they mostly practiced catch and release. SPSS Statistics 17.0® crosstabulations discussed above may be found in Appendix E #1.

Catch Disposition

Collectively, slightly larger number of respondents reported that they keep some and release some of their legal sized catch (36%), with slightly fewer reporting they mostly practiced catch and release or mostly keep their catch, 33% and 31% respectively. Anglers practicing catch and release were more likely to fish on rivers or to report fishing exclusively on rivers, exclusively on inland lakes or on rivers with inland lakes, were more likely to have fished before the age of 11, were much more likely to usually fish alone, more likely to live with children under the age of 5 and children age 6 to 17, were much more likely to report incomes of \$100,000 or more, were more likely to be college educated or hold an advanced degree and less likely to be retired.

Anglers reporting they keep some and release some of the legal sized fish they catch were more likely to fish on All waterbodies, were slightly more likely to fish with friends, were nearly equally likely to be male or female, were more likely to report incomes below \$50,000, more likely to report having a High School degree or GED or less than a High School degree.

Anglers reporting they usually keep the legal sized fish they catch were less likely to be under the age of 44, were more likely to fish on the Great Lakes and connecting waterways, were less likely to have fished before the age of 11, were more likely to have participated in a competitive fishing event, were less likely to live with children age 5 and under and children age 6 to 17, were less likely to be male, much less likely to report incomes greater than \$100,000, were less likely to be employed fulltime, and more likely to be retired. SPSS Statistics 17.0® crosstabulations discussed above may be found in Appendix E #2.

Recruitment

Over 75% of anglers reported fishing before the age of 11. We found no significant relationship between the age of recruitment and the social groups anglers reported fishing with, and little difference in the age of recruitment between residents and non-resident anglers.

Female anglers, anglers who have not participated in competitive fishing events, anglers reporting a High School degree or GED or Less than a High School degree, and anglers reporting income categories below \$49,999 were more likely to have fished after the age of 10. Conversely, males, anglers who have participated in competitive fishing events, anglers reporting Some post High School or some college and lower education categories, and anglers reporting incomes of \$100,000 were more likely to have fished before the age of 11. SPSS Statistics 17.0® crosstabulations discussed above may be found in Appendix E #3.

Waterbodies Fished / Site Preference

Collectively, 76% of all respondents indicated that they had fished on inland lakes in the last 12 months. Less than half of all respondents indicated they had fished on rivers or Great Lakes and connecting waterways, 44% and 42% respectively. When examining 7 combinations of these waterbodies, we found the largest group of anglers reported fishing exclusively on inland lakes (34%), followed by anglers who fished All waterbodies (16%), and anglers who fished both rivers and inland lakes (16%).

Anglers fishing on rivers were less likely to fish with family or relatives and more likely to report fishing with no one else, were less likely to own a boat for fishing, were

more likely to report incomes below \$25,000, were more likely to have less than a High School degree, and were more likely to be unemployed and were less likely to be retired. Anglers who reported fishing exclusively on rivers were also more likely to be unemployed and to report they fished with no one else.

Anglers fishing on inland lakes were less likely to fish with no one else and were more likely to fish with family or relatives, fished less frequently and were more likely to be retired. Anglers who reported fishing exclusively on inland lakes were also more likely to be retired and more likely to fish with family or relatives.

Anglers fishing on Great Lakes and connecting waterways were less likely to fish with no one else and more likely to fish with friends, were more likely to have a Bachelor's degree or advanced degree and were less likely to have less than High School Degree, were less likely to report an incomes below \$25,000 and were more likely to be employed fulltime. Anglers fishing exclusively on Great Lakes and connecting waterways were less likely to work part-time or be un-employed, were less likely to report incomes below \$25,000, and were more likely to fish with friends.

Anglers specializing in a particular waterbody (exclusively on rivers, exclusively on inland lakes or exclusively on Great Lakes and connecting waterways) fished less frequently than those anglers fishing on multiple waterbodies. Anglers reporting they fished All waterbodies were more likely to own a boat for fishing, were more were likely to be employed part-time and less likely to be retired, were more likely to fish with friends and fished more frequently, with 58% of anglers who reported fishing on All waterbodies fishing 20 or more times. SPSS Statistics 17.0® crosstabulations discussed above may be found in Appendix E #4.

Fishing Frequency

Collectively, 57% of anglers reported fishing 6 or more times in the last 12 months, with 27% reporting 20 or more trips. Anglers fishing fewer than 6 times were more likely to fish with family or relatives and were less likely to fish with no one else, were more likely to live with a spouse or significant other and less likely to live with children under 5, were more likely to have a Bachelor's degree or advanced degree and less likely to have a High School Degree or GED, were less likely to participate in a competitive fishing event, were less likely to own a boat they used for fishing, were more likely to be female, were more likely to report incomes over \$100,000, were more likely to be over the age of 65 and less likely to 25 to 34.

Anglers fishing 6 to 19 times were more likely to fish with family and relatives, and less likely to fish with friends, were more likely to live with children under 5 and less likely to live with extended family or other adults, were less likely to participate in a competitive fishing event, were more likely to be a resident, were more likely to own a boat for fishing, were less likely to report incomes of \$0 to 24,999.

Anglers fishing 20 or more times were more likely to fish with no one else and less likely to fish with family or relatives, were more likely to live with extended family or other adults and less likely to live with no one else, were less likely to have a Bachelor's degree or advanced degree, were more likely to have fished in a competitive fishing event, were more likely to own a boat the use for fishing, were more likely to be male, were more likely to be un-employed and less likely to be retired, were more likely to report incomes less than \$50,000 and less likely to report incomes of \$100,000 to

149,000 and more likely to be 25 to 34 and less likely to be 65 or older. SPSS Statistics 17.0® crosstabulations discussed above may be found in Appendix E #5.

DISCUSSION

Annual surveys of Michigan's recreational anglers were discontinued in the mid-1980's due to "concerns about nonsampling bias in the estimates" with the expectation that these surveys would resume following evaluation of these potential biases (Jamsen 1985). Nearly 25 years have passed since systematic statewide surveys of Michigan's recreational anglers have occurred.

The 2008 Michigan recreational angler survey and survey strategy were designed to minimize the effects of survey biases, collect both long term and short term angling behavior for all of Michigan's fisheries, measure angling seasonality, cover a large geographic area and incur low costs per respondent. The survey design is a reflection of the growing need to understand angler behavior in Michigan and advances in survey research. The concurrent collection of angler information unaffected by a longer recall, the need for periodic, comprehensive, system-wide data in Michigan, previously established mail survey methods within other divisions of the MNDR, and the ability to compare information to previous MDNR Fisheries Division research data also influenced our decision to implement statewide angler survey format which retained some aspects of year-long recall (Brown 1991). This report presents preliminary findings from the 2008 Michigan recreational angler survey focusing on basic frequency distributions and a preliminary examination of angler subgroups.

The collective response rate of 49% is comparable to angler mail surveys conducted by other researchers given that our respondents were not pre-selected, received a maximum of four contacts and received no incentives. The response rate reflects the saliency of the topic and care taken in survey design.

The results show that the proportion of female respondents and the mean age of respondents were significantly higher than non-respondents, additionally a smaller proportion of resident restricted licensees and 24 hour licensees responded to our survey, with the remaining commonly issued license types comprising a slightly larger proportion of our respondents. These results suggest future analysis and survey efforts may include data weighting or sampling stratification.

The majority of anglers (77%) reported fishing on inland lakes, which is comparable angler effort reported by Jamsen (1985). We also compared respondent age categories to both Kickuchi (1986) and Jamsen (1967). These comparisons suggest that anglers are aging without sufficient recruitment into younger age categories to replace an aging angler population. This report also provides important preliminary baseline information on fishing frequency, site preferences, tournament participation, recruitment, fishing experience, household structure, fishing behavior, and socioeconomic information. Additional information on fishing effort, details of angler trips and comparisons of species preferences and regional angling effort will be examined in future reports.

The majority of the variables we chose to examine in the current analysis were thought to be important attributes of angler subgroups (fishing frequency; waterbodies

fished; catch disposition; age of introduction to fishing) and proved to have significant associations with the socioeconomic characteristics we also tested.

Several studies have identified subgroups of anglers with different catch dispositions (e.g., Fedler and Ditton (1992); Bryan (1997); Fisher (1997); Chipman and Helfrich (1988); Hunt et al. (2002); Sutton (2003); Kyle et al. (2007); Anderson et al. (2007). In their study of Tennessee tailwater anglers, Hutt and Bettoli (2007) found consumptive and non-consumptive trout anglers (with differences in harvest rates and opinions on regulation) exhibited significant differences in income and education levels, with non-consumptive trout anglers the most educated and wealthiest group. In our sample, the practice of catch and release was more likely for anglers fishing on rivers, anglers who had begun fishing at an earlier age, for anglers who fish alone, and for anglers with higher incomes and education levels. Conversely, anglers reporting they mostly kept their legal size catch tended to be anglers who fished on the Great Lakes and connecting waterways, began fishing at a later age, and reported lower incomes and education levels.

The Michigan Decennial Census from 1990 to 2000 reported decreases in the percentages of individuals for most of the age categories over 45 years of age (with only a modest increase for the 60 to 64 age category) and increases in the percentages of individuals in age categories under 34. However smaller percentages of our respondents were found under the age of 34 and larger percentages of our respondents were found in age categories over the age of 44 than previous studies of Michigan residents (Kikuchi 1986) and (Jamsen 1967). These findings suggest that the angling population may be aging without sufficient recruitment to replace older anglers.

The process of aging produces lifestyle changes that influence angling behavior (Aas and Arlinghaus 2009) and we found important differences in fishing behavior between these age categories. Senior license holders were the largest license group to report that they had not fished in the last 12 months and anglers 55 and older were the largest group reporting that they had not fished in the last 12 months (66%) and the largest group reporting that they had fished one time (45%), with half of anglers over 65 reporting that they fished 5 or fewer times, and 22% reporting 20 or more trips. Anglers 55 and older were more likely than anglers in other age categories to report fishing at inland lakes, were less likely to report fishing at rivers and less likely to have fished before the age of 11. Anglers 65 and older were much more likely than other anglers to report they kept the legal sized fish they caught and were the least likely group to report they practice catch and release. Conversely, anglers 25 to 34 were least likely to report that they take fewer than 5 trips, most likely to report 20 or more trips and most likely to report trips to Great Lakes and connecting waterways. Anglers 34 and younger reported more trips to inland lakes but were more likely than other angler groups to report fishing on rivers and were more likely to report they fished before the age of 11. Anglers 44 and younger were much more likely to mostly practice catch and release and less likely than other angler groups to report they mostly keep their catch.

Fisher (1997) reported that changes in social group (e.g. fishing with a less specialized family members instead of friends) could lead to changes in motivation and participation. Fedler and Ditton (1994) examined seventeen angler motivation studies and found, across all studies, that many groups showed significant differences between ratings for being with family or friends, indicating preference for participating with one

group or another. Ditton (2004) emphasized that social groups play an important role in angling participation and in determining the meanings attributed to fishing and the experiences and outcomes sought by anglers. We found anglers who report they usually fish with family were less likely to fish more than 20 times and more likely to fish 1 to 5 times, were more likely to report fishing on inland lakes, and were less likely to be less than 25 years of age and more likely to be between the age of 45 and 64. Anglers who report they usually fish with friends were more likely to fish 1 to 5 times and less likely to fish 6 to 19 times, were more likely to fish on all waterbodies and less likely to fish exclusively on inland lakes, were more likely to be less than 25 years of age and more likely to be less than 25 times and less likely to fish 6 to 19 times, were more likely to fish on all waterbodies and less likely to fish exclusively on inland lakes, were more likely to be less than 25 years of age and more likely to be less than 25 years of age and more likely to be less than 25 years of age and more likely to fish 0 to 19 times, were more likely to fish 0 to 19 times, were more likely to fish 0 to 25 years of age and more likely to fish 0 to 19 times, were more likely to be less than 25 years of age and more likely to be between the age of 45 and 64. Anglers reporting they usually fish with no one else were more likely to fish 20 or more times and less likely to fish 1 to 5 times, were more likely to report fishing exclusively on rivers, were more likely to practice catch and release, and more likely to be over 55 and much less likely to be under the age of 25.

The influence of education on angling participation is less clear, with researchers in different Western countries reporting positive and negative relationships (Aas and Arlinghaus 2009). We found anglers with a college degree or advanced degrees fished less frequently, were more likely to report fishing before the age of 11, and more likely to report they practice catch and release. Anglers who reported having a High School degree or GED or having less than a high school degree fished more frequently, were more likely to report fishing exclusively on inland lakes and rivers with inland lakes, were less likely to have fished before the age of 11, and were less likely to report practicing catch and release. The mix of demographic conditions occurring in industrialized societies may have both negative and positive influences on angling demand (Aas and Arlinghaus 2009). However, researchers have emphasized that angler participation and behavior may also be influenced by other attributes (social background, culture and personality) (Aas and Arlinghaus 2009) and the actions of fisheries managers (Aas and Arlinghaus 2009; Ditton 2004). Understanding constraints to participation for angler subgroups with lower rates of participation and the socialization process and benefits sought by minority populations and improving accessibility for these groups may reverse many of the trends forecast (Ditton 2004).

There is a great need for research examining the effects of lifestyle changes including aging on angler preferences, the absolute number of anglers, participation rates and activity levels over time. (Aas and Arlinghaus 2009). Our data provide a preliminary examination of cross sectional profiles of Michigan's recreational anglers. We envision future research including further robust analysis of angler subgroups to provide managers with the information they need to manage and provide angling opportunities for the diverse angler groups fishing in Michigan.

APPENDIX A

This appendix contains:

1. Telephone Interview Script for the National Survey of Fisheries Management Agencies.

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National Survey of Fisheries Management Agencies Telephone Interview Script

INTRODUCTION (Identifying the correct personnel at the agency)

Hello, my name is Jody Simoes and I am a graduate student working in the Department of Fisheries and Wildlife at Michigan State University. I am conducting a survey of natural resource management agency's freshwater and saltwater fisheries programs as part of a graduate research project. This is a national survey to gain a better understanding of the state of economic and other human dimensions surveys conducted by and for natural resource management agency fisheries programs.

In order to collect this information I need to speak with the person at your office who may have the greatest knowledge of angler surveys conducted by agency staff or on behalf of the agency by an outside contractor. Who at your office would be able to speak to the various angler surveys conducted in your state?

INTERVIEW

Introduction (repeat this paragraph if transferred)

Hello, my name is Jody Simoes and I am a graduate student working in the Department of Fisheries and Wildlife at Michigan State University. I am conducting a survey of natural resource management agency's freshwater and saltwater fisheries programs as part of a graduate research project. This is an international survey to gain a better understanding of the state of economic and other human dimensions surveys conducted by and for natural resource management agency fisheries programs.

This questionnaire is part of a larger effort by Michigan State University to assess the type and frequency of economic and other human dimensions information collected by and on behalf of natural resource management agency fisheries programs in North America. The data collected in this survey will be compared to earlier survey efforts.

Consent Statement for Telephone Interview

By continuing with this interview, you indicate your voluntary consent to participate in this study and have your answers included in the project data set. Your participation is voluntary. Your refusal to participate in or to withdraw from the study carries no penalty or loss of any benefits. You are free to not answer any of the questions that I will ask you. However, I hope that you will agree to answer questions, as your answers are very important to this study. Answers are anonymous, and we will keep your individual views entirely confidential. Your privacy will be protected to the maximum extend allowable by law. If you have any questions or comments please contact me and if you have any questions concerning your rights as a survey participant, please contact the Director of the Human Research Protection Program at MSU.

Would you like me to fax or email a copy of this information to you, including the consent statement I just read and the contact information for the Project Investigator and the Director of the Human Research Program at MSU? No Yes (fax) Yes (e-mail)

Economic and Human dimensions Data Collection

Has your agency collected economic information directly from anglers in the form of surveys, interviews, websites, questionnaires, drop-off, diaries and logbooks or by other means? Before you answer, for the purposes of THIS study, economic data is data that is collected from anglers that may include information on anger's spending or willingness to pay. This includes miles traveled and other trip related expenses such as gas, food, and lodging expenditures.

Has your agency's fisheries program collected economic information as I have described? YES NO DK

Does your agency collect human dimensions information, other than economic information, directly from anglers in the form of surveys, interviews, websites, questionnaires, drop-off, diaries, logbooks or other means? Before you answer, for the purposes of THIS study, human dimensions data is data that is collected from anglers on a local, regional or statewide basis other than effort, catch and harvest information. These may include questions that ascertain angler satisfaction, angler opinions, angler preferences, angler motivations and angler perceptions. Data collected on anglers may include age; sex; race; income; angling experience; angling techniques; angling methods; angling equipment. Other human dimensions questions include reasons for site selection and asking anglers to rank items such as fishing trip experience, shore side facilities, state programs, regulations and enforcement as well as preferences for certain types of fishing.

Has your agency's fisheries program collected human dimensions information as I have described?

YES NO Don't Know (DK)

Use the responses to the questions (above) to determine which of the following questions to ask.

| Natural Resource Management Agency Contact Information | |
|--|--|
| Agency Name: | |
| Contact Person(s): | |
| Address: | |
| Phone: | |
| Fax: | |

The following questions, unless otherwise noted, pertain to all human dimensions information, including economic information.

1. For how many years have YOU been working on human dimensions research with your current agency: _____ DK

- 2. For how many years has the agency been involved in the collection of human dimensions data: DK
- 3. When was the most recent collection of human dimensions survey data conducted:

DK

- 4. When is the next collection of human dimension data scheduled: ____ DK
- 5. How would you rate the overall quality of human dimensions data collected by your agency: (Excellent; Good; Fair; Poor; DK)
- 6. How are human dimensions data utilized by the natural resource management agency: (check all that apply):
 - State-wide strategic resource management plans (a.k.a. conservation and recreation plans; wildlife action plans)
 - Local resource management plans
 - The design of fishery regulations (creel and species limits)
 - Development of angler educational and outreach programs and materials
 - Other (please specify)
- 7. Is your agency required or mandated by any of the following to collect human dimensions information?
 - The State
 - The agency
 - Other entity
 - Not required •
- 8. How would you rate the utilization of human dimensions data collected by your agency:

(Excellent; Good; Fair; Poor; DK)

- 9. Does the agency maintain on staff, human dimensions personnel (with educational background and/or training in areas of sociology, psychology, anthropology, communications, public relations, marketing or related fields) who are available to work on the collection and/or analysis of human dimensions data? YES NO DK
- 10. Does the agency maintain on staff, an economist (with educational background and/or training in the areas of socioeconomics, resource economics, environmental economics or related fields) who are available to work on the collection and/or analysis of economic data? YES NO DK

- 11. Does the agency maintain a special section, division or department devoted to working on the collection and analysis of socioeconomic, economic or human dimensions angler information: YES NO DK
- 12. How would you rate the importance of the following issues for your State's fishery (check all that apply):

| | Not | Slightly | Moderately | Very | Extremely |
|--|----------------------------|---------------|------------|------|-----------|
| Habitat degradatio | n | | | • | - |
| (invasive species, | drought, pol | lution, devel | opment) | | |
| • | 1 | 2 | 3 | 4 | 5 |
| Access and faciliti | es | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Declining angler p (recruitment and r | articipation retention) | | | | |
| | 1 | · 2 | 3 | 4 | 5 |
| State budget short | ages 1 | 2 | 3 | 4 | 5 |
| Other (please spec | ify) 1 | 2 | 3 | 4 | 5 |

13. How would you rate the importance of the following information to current fisheries management decision-making in your agency: (not important at all; slightly important; moderately important; very important; extremely important)

|] | Not | Slightly | Moderately | Very | Extremely |
|---|------|----------|------------|------|-----------|
| Angler support for management regulat | ions | | - | - | - |
| | 1 | 2 | 3 | 4 | 5 |
| Angler motivations | | | | | |
| - | 1 | 2 | 3 | 4 | 5 |
| Economics of recreational fishing | | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Angler attitudes and opinions | | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Demographic characteristics of anglers | | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| General public attitudes and opinions | | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Angler satisfaction | | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Species-specific angler market informat | ion | | | | |
| · · · · | 1 | 2 | 3 | 4 | 5 |

Partnerships

- 14. Which of the following entities does your agency partner with to achieve its goals for communicating with anglers (check all that apply):
 - Universities/Colleges
 - Recreational Businesses
 - National and local fishing organizations, foundations or clubs
 - Consulting firms
 - Other entities
 - The agency DOES NOT engage in ANY partnerships to achieve Advertising and Marketing goals
- 15. Which of the following entities does your agency partner with to develop fishing programs, activities and services (check all that apply):
 - Universities/Colleges
 - Recreational Businesses
 - National and local fishing organizations, foundations or clubs
 - Consulting firms
 - Other entities
 - The agency DOES NOT engage in ANY partnerships to develop fishing programs, activities and services
- 16. Which of the following entities does your agency partner with to gather economic data:
 - Universities/Colleges
 - Recreational Businesses
 - National and local fishing organizations, foundations or clubs
 - Consulting firms
 - Other entities
 - The agency DOES NOT engage in ANY partnerships to gather economic data
- 17. Which of the following entities does your agency partner with to gather human dimensions data, other than economic data:
 - Universities/Colleges
 - Recreational Businesses
 - National and local fishing organizations, foundations or clubs
 - Consulting firms
 - Other entities
 - The agency DOES NOT engage in ANY partnerships to gather human dimensions data

APPENDIX B

This appendix contains:

- 1. Appendix B# 1, Michigan Recreational Angler Survey, Version 1.
- 2. Appendix B# 2, Michigan Recreational Angler Survey, Version 2.

| MICHIGAN STATE UNIVERSITY MICHIGAN | FISHING | SUR | VEY | <u>r</u> | | | A A | C |
|--|--|---|---------------------------------------|---|---------------------------------|---|--------------------------|--------------|
| PART A: YOUR MICHIGAN FI | SHING DURI | NG TH | | ST 12 | MONT | HS | othe | |
| 1. In the past 12 months, did you go fishing <u>in</u> <u>Michigan</u> ? No (skip to PART D, question 9) Yes | 5. For each which m type of f (check a | of the ethods ish in l II that a | types s, if an Michig opply) | sing i s of fis by, you jan in t | h listed used to the past | below, i o try cat t 12 mon | indica ching nths. | ite that |
| 2. In the past 12 months, how many times have you gone fishing in Michigan? 1 time 2 or 3 times 10 to 19 times 4 or 5 times 20 or more times 3. In the past 12 months, what types of water bodies did you fish at in Michigan? (check all that apply) | <u>Type of fish</u> Bass Catfish Panfish | O O Natural Bait | 🗌 🗌 Artificial Bait | Trolling | Casting from Casting from | Image: Case of the second s | 🗌 🔲 Ice fishing | Other method |
| Michigan rivers Michigan inland lakes Great Lakes and connecting waterways 4. In the past 12 months, have you competed in any fishing events in Michigan? No Yes → (If Yes) How many events? | Pike Salmon Suckers Trout Walleye Other | | | | | | | |
| PART B: YOUR MIC | HIGAN FISH | ING IN | JULY | 1 2008 | | | | |
| Did you go fishing in <u>Michigan</u> during the month of <u>JULY 2008</u>? | (lf Ye | s) Circl | e the c | lays th | at you fi | shed in . | JULY | |
| ─No (skip to PART C, question 7) | | | | July 20 | 80 | | | |
| □Yes → | S | м | Т | w | Т | F | S | |
| | | | 1 | 2 | 3 | 4 | 5 | |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 | _ |
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 | _ |
| | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 4 |
| | 21 | 28 | 29 | 30 | 31 | + | | _ |
| | <u>i</u> | | | 1 | | 1 | l | |



PART C: YOUR TWO MOST RECENT MICHIGAN FISHING TRIPS For the purposes of this survey, a fishing trip is any time you went fishing, no matter where or how long you fished.

| | | | 7. Your Most Recent Michigan Fishing Trip | | | 8. Your Second Most Recent Michigan Fishing Trip | | |
|---|--|-----------------------|--|----------|-----------------------|---|---------------|--|
| Trip Characteristics | | • | | | ł | | | |
| Date | | month: | ye | ear: | month: | y | ear | |
| Was fishing the main purpose of the trip? | | | | ∐Yes □No | | | | |
| Was it an overnight trip? | | | | | | □Yes □No | | |
| How many days did you fish on this trip? | | dav(s) | | | dav(s) | | | |
| Did you fish at multiple rivers or lakes? | | | | | | | | |
| Main Trir | | | |]. 10 | L | | _110 | |
| (where m | nost time was spent) | 1 | • | | | • | | |
| River or Lake (check one) | | River Lake | | | | | | |
| Name of River or Lake | | | | | | | | |
| Nearest cr | tv/town/village | | | | | | | |
| County | | | | | | | | |
| Please mark the general location on the man | | But an "V" on the man | | | Put an "Y" on the man | | | |
| Ficase mark the general location on the map | | | | | Put an A on the map | | | |
| Primary | risning Mode (check one) | | Y | | | <u> </u> | | |
| Primarily from the shoreline | | | | | | | | |
| Primarily wading | | | | | | | | |
| Primarily from a boat (trailored to site) | | | | | | | | |
| Primarily from a boat (already at site) | | | | | | | | |
| Charter bo | | | L L | | | Ц | | |
| Ice isning | | | | | | | | |
| Fish Spe | cles You Targeted, Caught or | Targeted | Number | Number | Targeted | Number | Number | |
| Released | (check all that apply) | | Caught | Released | | Caught | Released | |
| Bass | | | fish | fish | | fish | fish | |
| C | | H | tish | fish | | | | |
| Carp Carp | Common Carp Rullhead Channel and Elathoad | | TISN | IISN | | IISN | 11SN | |
| Dikee | Muske/Muskellunce | | fich | lish | | fieb | lish | |
| , IKC J | Pike | | fish | lish | | fish | fish | |
| Panfish | Yellow Perch | | fish | fish | | fish | fish | |
| | White Perch or White Bass | Ö | fish | fish | | fish | fish | |
| | Bluegill/ Pumpkinseed/Sunfish | | fish | fish | | fish | fish | |
| | Black/White Crappie | | fish | fish | | fish | fish | |
| | Rock Bass | | fish | fish | | fish | fish | |
| Salmon | Chinook/King Salmon | | fish | fish | | fish | fish | |
| & | Coho/Silver Salmon | | fish | fish | | fish | fish | |
| Trout | Rainbow Trout (Steelhead) | | fish | fish | | fish | fish | |
| | Brook/Speckled Trout | | fish | fish | | fish | fish | |
| | Brown Trout | | fish | fish | | fish | fish | |
| | Lake Trout | | fish | fish | | fish | fish | |
| O | Lake Whitefish/Whitefish | H | fish | tish | | tish | fish | |
| SUCKERS | Longnose, Redhorse and White | | tish | tish | | | | |
| Walleye | Vvaneye Nama | | Tish | fish | | | 11SN | |
| Speciae | Name | | IISN | IISN | | IISN 6ch | IISN 6cb | |
| -heres | Name: | | 11SH | lish | | IISH | 11511 fich | |
| | | | fish | fish | | | lish | |
| Individual answers an | e CONFIDENTIAL. |
|---|---|
| About how old were you the first time you went fishing? (even if you did not catch a fish) years old | 16.Do you use a computer to access the internet for personal use? No Yes |
| 10. How many years have you fished <u>in Michigan</u> ? years | 17. In the past 12 months, have you fished in other countries or in other states, <u>besides Michigan</u> |
| 11. Do any of the following live in your household? | |
| (check all that apply) Spouse or significant other Children age 5 and under Children age 6 to 17 years old Other immediate family Extended family members or other adults None of these | 18. Which of the following best describes your employment status? (check one) Employed fulltime Part-time Retir Un-employed Other 19. What is your highest level of education? |
| 12. How many people in your household have a current fishing license, including yourself? | (check one) Less than High School degree High School degree or GED Some post High School or some college Bachelor's Degree Graduate Degree |
| 13. Which of the following best describes who you usually fish with? (check one) No one else Friends Family / relatives Other | 20. What is your race or ethnic background? (check all that apply) Asian |
| 14. Do you own a boat that you use for fishing? No Yes → (if Yes) Check all that apply Motor boat Canoe/kayak Other | Alaska American Black or African American Native Hawaiian or Pacific Islander Hispanic, Latino or Spanish Origin White, non-Hispanic Other |
| 15. When you go fishing, what do you usually do with the legal size fish you catch? (check one) | 21.Which of the following best describes your annual household income? (check one) \$0- 24,999 \$\begin{bmatrix} \$75,000-99,999 |
| Keep some | \$25,000-49,999 \$100,000-149,999 \$50,000-74,999 \$150,000 or more |
| omments: | |

| | MICHIGAN STATE UNIVERSITY MICHIGAN PART A: YOUR FISHING IN MIC Please complete and return this questionnai | FISHING CHIGAN DUI | SUR RING T did no | VEY HE PA | AST 12 hing in | MON the pa | ITHS ist 12 | mon | ths. | |
|----|---|---|--|--|---|------------------------------|--|-------------------------|--------------------------|--------------|
| 1. | In the past 12 months, did you go fishing <u>in</u> <u>Michigan?</u> No (skip to PART D, question 8) Yes | 5. For each which m type of f (check a | of the ethods ish in M II that a | types , if any lichiga pply) [| of fish 7, you u an in th Method | listed used to le pass | belov otry c t 12 m <u>hing</u> | w, in catch nonti | dicate ning ti าร. | nat |
| 2. | In the past 12 months, how many times have you gone fishing in Michigan? 1 time 6 to 9 times 2 or 3 times 10 to 19 times 4 or 5 times 20 or more times | <u>Type of fish</u> Bass | ☐ Natural Bait | ☐ Artificial Bait | Trolling | □ Casting from boat | Casting from shore/pier | 📙 Fly fishing | ☐ Ice fishing | Other method |
| 3. | In the past 12 months, what types of water bodies did you fish at in Michigan? (check all that apply) | Catfish Panfish Pike Salmon Suckers | | | | | | | | |
| 4 | In the past 12 months, have you competed in any fishing events in Michigan? □No □Yes → (If Yes) How many events? fishing events | Walleye Other | | | | | | | | |
| | PART B: YOUR MIC | HIGAN FISH | ING IN | JULY | 2008 | | | | | |
| | 6. Did you go fishing <u>in Michigan during</u> the | (If Y | es) Circ | le the | days th | at you | fished | d in J | ULY | |
| | month of <u>JULY 2008</u> ? | S | м | т | Jury 20 | T | | F | S | - |
| | INO (skip to PART C, question 7) | | | 1 | 2 | 3 | | 4 | 5 | |
| | L]Yes ➡ | 6 | 7 | 8 | 9 | 10 | b | 11 | 12 | |
| | | 13 | 14 | 15 | 16 | 17 | 7 | 18 | 19 | |
| | | 20 | 21 | 22 | 23 | 24 | 4 | 25 | 26 | _ |
| | | 27 | 28 | 29 | 30 | 3 | 1 | | | - |
| | | | | L | 1 | | | _ | L | |



PART C: YOUR MOST RECENT MICHIGAN FISHING TRIP

| | | 7. You | ır Most Re | cent Michigan Fishing Tri |
|-----------------------------|--|----------|------------------|---------------------------|
| Trip Cha | racteristics | | 4 | ····· |
| Date | ······································ | mo | nth: | year: |
| Was fishir | ng the main purpose of the trip? | | TYes | |
| Was it an | overnight trip? | ' ' | □Yes | |
| How man | v days did you fish on this trin? | ' | ا دی . ب /veh | (s) |
| Did you fe | sh at multiple rivers or lake? | , | uay(| |
| | | _ | | |
| wain Ini (where r | p Locadon nost time was spent) | | \bullet | |
| River or I | ake (check one) | | River | |
| Name of f | River or Lake | · · | | |
| Nearest o | itultoum/village | | ········ | |
| Court | ICAL AND AND A CONTRACT OF | | | |
| | | | | |
| Please ma | ark the general location on the map | | utan "X" on ∎ | i the map |
| Primary | Fishing Mode (check one) | | • | |
| Primarily 1 | from the shoreline | 1 | | |
| Primarily v | wading | | | |
| Primarily 1 | from a boat (trailored to site) | | | |
| Primarily 1 | from a boat (already at site) | 7 | | |
| Charter bo | pat | | | |
| ice fishing |] | | | |
| Fish Spe | cies You Targeted, Caught or Released | Targeted | Number | Number |
| (check al | I that apply) | | Caught | Released |
| Rase | Largemouth | | fish | fish |
| | Smallmouth | | fish | fish |
| Carp | Common Carp | | fish | fish |
| Catfish | Bullhead, Channel and Flathead | | fish | fish |
| Pikes | Muskie/Muskellunge | | fish | fish |
| | Pike | | fish | fish |
| | Yellow Perch | | fish | fish |
| | White Perch or White Bass | | fish | fish |
| Panfish | Bluegill/Pumpkinseed/Sunfish | | fish | fish |
| | Black/White Crappie | | fish | fish |
| | ROCK Bass | | fish | fish |
| | | | fish | IISN |
| 0 alar | Cond/Silver Salmon | | TISN | IISN |
| saimon | Randow I rout (Steenead) | | | IISIN |
| a Trout | | | IISN | IISII fich |
| ut | | | IISN | IISH fich |
| | Lake MunitafishAN hitafish | | fieb | listi fieb |
| | Lave AATHENSINAATHENSI | | fich | fieh |
| Bucker | Longnose Redborse and White | | 10511 | 11311 |
| Suckers | Longnose, Redhorse and White | | fich | fich |
| Suckers Walleye | Longnose, Redhorse and White Walleye | | fish | fish |
| Suckers Walleye Other | Longnose, Redhorse and White Walleye Name: | | fish | fish fish fish |

For the purposes of this survey, a fishing trip is any time you went fishing, no matter where or how long you fished.

| About how old were you the first time you went fishing? (even if you did not catch a fish) years old | 15. Do you use a computer to access the internet for personal use? No Yes |
|--|--|
| 9. How many years have you fished in Michigan? | 16. In the past 12 months, have you fished in othe countries or in other states, <u>besides Michigan</u> ? □ No |
| 10. Do any of the following live in your household? (check all that apply) Spouse or significant other Children age 5 and under Children age 6 to 17 years old Other immediate family Extended family members or other adults | Yes 17. Which of the following best describes your employment status? (check one) Employed fulltime Part-time Retir Un-employed Other |
| None of these 11. How many people in your household have a current fishing license, including yourself? people | 18. What is your highest level of education? (check one) Less than High School degree High School degree or GED Some post High School or some college Gachelor's Degree Graduate Degree |
| 12. Which of the following best describes who you usually fish with? (check one) No one else Friends Family / relatives 13. Do you own a boat that you use for fishing? No Yes → (if Yes) Check all that apply Motor boat Canoe/kayak Other | 19. What is your race or ethnic background? (check all that apply) Asian American Indian or Alaska Native Black or African American Native Hawaiian or Pacific Islander Hispanic, Latino or Spanish Origin White, non-Hispanic Other |
| 14. When you go fishing, what do you usually do with the legal size fish you catch? (check one) Mostly keep my catch Keep some, release some Mostly catch and release | 20. Which of the following best describes your annual household income? (check one) □ \$0-24,999 □ \$75,000-99,999 □ \$25,000-49,999 □ \$100,000-149,999 □ \$50,000-74,999 □ \$150,000 or more |
| omments: | I |

APPENDIX C

This appendix contains:

1. Michigan Recreational Angler Survey cover letters.

DATE

Jane Doe 123 Main Street Lansing, MI 48915

Your help is needed with a study of fishing in Michigan. The study is being conducted by Michigan State University's Department of Fisheries and Wildlife for the Michigan Department of Natural Resources, Fisheries Division. The results from this survey will help natural resource agencies make fisheries management decisions that better reflect the needs of people that fish in Michigan.

You are part of a small sample of people being asked about their fishing activities. *Your* answers are needed to help ensure the results accurately represent the people who fish in Michigan.

Whether you go fishing often or only occasionally, *your input is important*. Please let us know what you think by completing the enclosed questionnaire and returning it in the prepaid envelope.

Your individual views will be completely confidential and your privacy will be protected to the maximum extent permitted by law. Also, your participation in the survey is voluntary, and you may refuse to answer certain questions. If you have any concerns or questions about this research study, such as scientific issues, how to do any part of it, or if you believe you have been harmed because of the research, please contact Frank Lupi, Department of Fisheries and Wildlife, Michigan State University, 13 Natural Resources Building, East Lansing, MI 48824-1222; lupi@msu.edu, 517-432-3883.

If you have any questions or concerns about your role and rights as a research participant, or would like to register a complaint about this research study, you may contact, anonymously if you wish, Michigan State University Human Research Protection Program at 517-355-2180, FAX 517-432-4503, or e-mail irb@msu.edu, or regular mail at: 202 Olds Hall, Michigan State University, East Lansing, MI 48824.

Thank you very much for helping with this important study.

Sincerely,

That for

Frank Lupi Associate Professor Enclosure

DATE

Jane Doe 123 Main Street Lansing, MI 48915

I recently sent you a survey about your fishing activities in Michigan. To the best of my knowledge, I have not heard from you.

I am writing to you again because **your input is vital!** You are part of a small sample of people who are being asked about their fishing activities.

Your answers are needed to help ensure the results accurately represent the people who fish in Michigan. *Your answers* will help natural resource agencies make management decisions that better reflect the needs of people that fish in Michigan.

Please take a few minutes to share your viewpoint by filling out this short survey.

Your individual views will be completely confidential and your privacy will be protected to the maximum extent permitted by law. Also, your participation in the survey is voluntary, and you may refuse to answer certain questions. If you have any concerns or questions about this research study, such as scientific issues, how to do any part of it, or if you believe you have been harmed because of the research, please contact Frank Lupi, Department of Fisheries and Wildlife, Michigan State University, 13 Natural Resources Building, East Lansing, MI 48824-1222; lupi@msu.edu, 517-432-3883.

If you have any questions or concerns about your role and rights as a research participant, or would like to register a complaint about this research study, you may contact, anonymously if you wish, Michigan State University Human Research Protection Program at 517-355-2180, FAX 517-432-4503, or e-mail irb@msu.edu, or regular mail at: 202 Olds Hall, Michigan State University, East Lansing, MI 48824.

Thank you very much for helping with this important study.

Sincerely,

That for

Frank Lupi Associate Professor Enclosure

APPENDIX D

This appendix contains:

- 1. Appendix D#1, mailing dates and rate of return by field week for test of trip details.
- 2. Appendix D#2, mailing dates and rate of return by field week for test of materials and personalization.

Mailing dates and rate of return by field week: Testing Trip Details

The initial survey instrument and contact letter were mailed on September 23, 2008. This was followed by the first reminder / thank you postcards mailed on September 29, 2008. Peak survey returns of 850 returned surveys occurred within the first full field week which was described as ending on October 3, 2008. The replacement survey instrument and cover letter were mailed on October 15 during the third full week. A second, smaller wave of surveys returned within week 4 (251) and week 5 (517). A second reminder / thank you postcard was mailed on October 29th at the beginning of the 6th week in the field, completing the mailing sequence. The return estimates below include the approximately 107 respondents who returned both the initial questionnaire and the replacement questionnaire; therefore individual returns following the mailing of the replacement questionnaire are inflated. These surveys were not included in our final analysis, however they are included in this figure.



Figure 1 Approximate return rates, Round 1.

Mailing dates and rate of return by field week: Personalization and Materials

The initial survey instrument and contact letter were mailed on September 29, 2008 and September 30, 2008. This was followed by the first reminder / thank you postcards mailed on October 6, 2008 and October 7, 2008. Peak survey returns of 902 returned surveys occurred within the first full field week which was described as ending on October 10, 2008. The replacement survey instrument and cover letter were mailed on November 6, 2008 and November 7, 2008 during the fifth full week. A second, smaller wave of surveys returned within week 6 (229) and week 7 (522). A second reminder / thank you postcard was mailed on November 15, 2008 and November 19, 2008 at the beginning of the 6th week in the field, completing the mailing sequence. The return estimates below include the approximately 206 respondents who returned both the initial questionnaire and the replacement questionnaire; therefore individual returns following the mailing of the replacement questionnaire are inflated. These surveys were not included in our final analysis, however they are included in this figure.





APPENDIX E

This appendix contains:

- 1. Appendix E #1, SPSS Statistics 17.0[®] crosstabulations, license type.
- 2. Appendix E #2 SPSS Statistics 17.0[®] crosstabulations, catch disposition.
- 3. Appendix E #3, SPSS Statistics 17.0® crosstabulations, recruitment.
- 4. Appendix E #4, SPSS Statistics 17.0[®] crosstabulations, site preference.
- 5. Appendix E #5, SPSS Statistics 17.0[®] crosstabulations, fishing frequency.

| | 4 | APPENI | JIX E# | I SPSS | Statistic | cs 17.00 | R) crosst | abulatio | ns, lice | nse type | | | | |
|--|---------|--------------|--------------|--------------|--------------|--------------------|------------------|--------------------------|-------------------------------|---------------|--------------|--------------|----------------|------------------|
| CROSSTABS: FISHI Column Distributions | NG FRE | QUENC | × | | | | | CROSS FREQU Row Di | TABS: 1 JENCY stributio | FISHING as | | | | |
| License Type <i>p</i> <,001 | 0 times | l time | 2 or 3 times | 4 or 5 times | səmit 9 ot ð | 20 to 15 times | 20 or more times | səmit 0 | l time | 2 or 3 times | 4 or 5 times | səmit 9 ot ð | səmit 91 ot 01 | 20 or more times |
| Resident Restricted | 31.0% | 22.9% | 35.7% | 38.8% | 44.1% | 41.1% | 42.3% | 2.9% | 4.9% | 14.4% | 14.9% | 16.2% | 17.8% | 28.9% |
| Senior Restricted | 19.0% | 5.3% | 8.2% | 8.1% | 6.4% | 5.6% | 4.7% | 10.4% | 6.5% | 19.0% | 17.9% | 13.7% | 14.0% | 18.5% |
| Non-resident Restricted | 3.3% | 11.4% | 9.1% | 9.0% | 8.6% | 5.2% | 2.9% | 1.8% | 14.0% | 21.2% | 20.0% | 18.5% | 13.1% | 11.3% |
| Resident All Species | 17.4% | 9.9% | 16.5% | 22.8% | 25.9% | 35.0% | 40.0% | 2.3% | 3.0% | 9.3% | 12.3% | 13.4% | 21.2% | 38.4% |
| Senior All Species | 17.9% | 3.9% | 6.1% | 7.7% | 7.0% | 8.6% | 7.8% | 8.7% | 4.2% | 12.6% | 15.0% | 13.2% | 18.9% | 27.4% |
| Non-resident All Species | 1.6% | 3.1% | 4.5% | 3.5% | 4.5% | 3.3% | 1.5% | 1.9% | 8.3% | 22.3% | 16.6% | 20.4% | 17.8% | 12.7% |
| 24 Hour | 9.8% | 43.5% | 20.0% | 10.1% | 3.5% | 1.2% | 0.8% | 3.8% | 37.8% | 33.0% | 15.8% | 5.3% | 2.1% | 2.3% |
| | | | | | | | | | | | | | | |
| CROSSTABS: SITE | PREFEI | RENCE | | | | CR | OSSTAI | BS: SITE | PREFE | RENCE | | | | |
| Column Distribution | S | | | | | Ro | w Distrit | outions | | | | | | |
| License Type p < 001 | Β. | livers | Inland I | akes | Great Lak | es R | livers | Inland L | akes C | ireat Lake | s | | | |
| Resident Restricted | 4 | 10.1% | 81.3 | % | 34.7% | 2 | 5.7% | 52.19 | % | 22.2% | | | | |
| Senior Restricted | 7 | 2.8% | 75.6 | % | 24.1% | | 8.6% | 61.79 | % | 19.7% | | | | |
| Non-resident Restricte | i b | 2.4% | 87.3 | % | 18.2% | | 0.5% | 74.0% | ~ | 15.4% | | | | |
| Resident All Species | 9 | 3.8% | 78.7 | % | 60.6% | <u>~</u> | 1.4% | 38.7% | % | 29.8% | | | | |
| Senior All Species | 4 | 15.8% | 73.4 | % | 45.5% | 7 | 7.8% | 44.6% | % | 27.6% | | | | |
| Non-resident All Snecies | Ś | %6 .0 | 58.5 | % | 45.3% | ر م | 2.9% | 37.89 | ~ | 29.3% | | | | |
| 24 Hour | 2 | 8.8% | 53.2 | % | 42.3% | 2 | 3.1% | 42.80 | % | 34.0% | | | | |

in line يم فما سطمهم APPENDIX F #1 SPSS Statistics 17 00 cm

| CROSSTABS: SITE Column Distributions | PREFER | ENCE | | | | | | CROSS Row Di | TABS: S stribution | ITE PRI | SFEREN | CE | | |
|---|-------------|--------------|------------------------------|--------|------------------------|-------------------------|-----------------|-----------------|-----------------------|--------------------------------------|--------|------------------------|-------------------------|-----------------|
| License Type <i>p</i> <001 | Great Lakes | səxeJ bnainī | Inland Lakes and Great Lakes | Rivers | Rivers and Great Lakes | Rivers and Inland Lakes | All Waterbodies | Great Lakes | səyeJ puşini | Inland Lakes and Great L akes | Rivers | Rivers and Great Lakes | Rivers and Inland Lakes | All Waterbodies |
| Resident Restricted | 30.4% | 46.7% | 36.3% | 32.2% | 32.0% | 43.6% | 31.1% | 9.4% | 41.2% | 9.4% | 6.3% | 3.0% | 17.8% | 12.9% |
| Senior Restricted | 7.5% | 10.5% | 2.6% | 5.6% | 5.1% | 4.1% | 0.9% | 14.5% | 58.4% | 4.3% | 6.9% | 3.0% | 10.6% | 2.3% |
| Non-resident Restricted | 4.9% | 14.3% | 4.1% | 2.7% | 1.7% | 2.6% | 1.0% | 8.8% | 72.7% | 6.1% | 3.0% | %6.0 | 6.1% | 2.4% |
| Resident All Species | 23.8% | 10.2% | 37.1% | 23.1% | 36.0% | 36.0% | 55.6% | 10.3% | 12.6% | 13.4% | 6.3% | 4.7% | 20.5% | 32.3% |
| Senior All Species | 7.6% | 6.1% | 0%0.6 | 0.9% | 6.7% | 6.8% | 7.6% | 12.7% | 29.1% | 12.4% | 10.5% | 3.4% | 15.0% | 16.9% |
| Non-resident All Species | 3.6% | 2.1% | 4.3% | 8.8% | 6.7% | 2.3% | 2.3% | 13.2% | 22.6% | 13.2% | 20.8% | 7.5% | 11.3% | 11.3% |
| 24 Hour | 22.2% | 10.0% | 6.7% | 17.7% | 11.8% | 4.5% | 1.5% | 28.1% | 36.1% | 7.1% | 14.2% | 4.5% | 7.5% | 2.6% |
| | | | | | | | | | | | | | | |

| CROSSTABS: AGE FI | RST FISI | HED "Re | scruitmen | it" | | | | CROSS | TABS: A | NGE FIR | ST FIS | HED "I | Recruitm | nent" |
|-----------------------------|-----------------|---------|------------|----------|----------|----------|---------|--------|-----------|----------------|----------|----------|--------------|---------|
| Column Distributions | | | | | | | | Row Di | stributio | su | | | | |
| License Type <i>p</i> <.001 | ζ of 0 | 01 01 9 | č [01] [| 02 ot 91 | 52 01 [2 | 0E 01 92 | snlq 0£ | ζ ot 0 | 01 01 9 | či ot [[| 02 ot 91 | 52 of 12 | 0E 01 92 | sulq 0£ |
| Resident Restricted | 38.6% | 38.5% | 40.2% | 42.2% | 41.5% | 30.8% | 36.8% | 46.3% | 42.7% | 5.8% | 1.8% | 1.1% | 0.4% | 1.8% |
| Senior Restricted | 3.5% | 8.2% | 14.5% | 16.9% | 17.0% | 7.7% | 11.6% | 24.1% | 53.0% | 12.0% | 4.2% | 2.7% | 0.6% | 3.3% |
| Non-resident Restricted | 6.7% | 6.7% | 7.2% | 3.6% | 7.5% | 3.8% | 6.3% | 46.4% | 43.4% | 6.0% | 0.9% | 1.2% | 0.3% | 1.8% |
| Resident All Species | 34.5% | 23.0% | 14.5% | 16.9% | 9.4% | 34.6% | 14.7% | 58.1% | 35.9% | 2.9% | 1.0% | 0.4% | 0.7% | 1.0% |
| Senior All Species | 4.3% | 10.3% | 12.7% | 8.4% | 7.5% | 11.5% | 9.5% | 26.3% | 58.4% | 9.3% | 1.9% | 1.1% | 0.8% | 2.4% |
| Non-resident All Species | 3.0% | 3.4% | 4.0% | 3.6% | 0.0% | 3.8% | 3.2% | 43.8% | 45.0% | 6.9% | 1.9% | 0.0% | %9 .0 | 1.9% |
| 24 Hour | 9.4% | 9.8% | 6.9% | 8.4% | 17.0% | 7.7% | 17.9% | 45.1% | 43.7% | 4.0% | 1.5% | 1.9% | 0.4% | 3.5% |
| | | | | | | | | | | | | | | |

| CROSSTABS: CATCH DI | ISPOSITION | | | CROSSTABS: | CATCH DISP | NOITION |
|---------------------------------|----------------------------|-----------------------------|-------------|----------------------------|-----------------------------|-------------|
| Column Distributions | | | | Row Distributic | ons | |
| License Type <i>p <</i> .001 | Keep some, Release some | Mostly catch and release | Mostly Keep | Keep some, Release some | Mostly catch and release | Mostly Keep |
| Resident Restricted | 38.4% | 41.2% | 36.0% | 35.4% | 35.6% | 29.0% |
| Senior Restricted | 5.9% | 5.3% | 9.0% | 31.5% | 26.4% | 42.0% |
| Non-resident Restricted | 7.1% | 7.2% | 5.6% | 37.8% | 36.0% | 26.1% |
| Resident All Species | 29.8% | 24.9% | 28.0% | 38.4% | 30.1% | 31.5% |
| Senior All Species | 8.0% | 4.5% | 10.6% | 37.2% | 19.6% | 43.2% |
| Non-resident All Species | 2.9% | 4.8% | 2.1% | 31.3% | 49.1% | 19.6% |
| 24 Hour | 8.0% | 12.1% | 8.6% | 29.6% | 42.3% | 28.1% |

| CROSSTABS: SITE PREFH | ERENCE | | | CROSS | TABS: SITE PI | REFERENCE |
|------------------------------|--------|--------|--------------|--------|----------------|-------------|
| Column Distributions | | | | Row Di | stributions | |
| Catab Dismosition = / 001 | Dinere | Inland | Grant I abae | Divers | Inland I abac | Graat Labac |
| | VIVE S | Lakes | UICAL LANCS | | IIIIAIIN LANCS | UICAL LANCS |
| Keep and Release Some | 46.0% | 78.6% | 46.2% | 26.9% | 46.0% | 27.1% |
| Catch and Release | 47.7% | 81.2% | 30.4% | 30.0% | 51.0% | 19.1% |
| Mostly keep my catch | 36.3% | 69.7% | 50.4% | 23.2% | 44.5% | 32.2% |

| catch disposition | |
|------------------------------------|--|
| 7.0 [®] crosstabulations, | |
| APPENDIX E #2 SPSS Statistics 1 | |

| CROSSTABS: SITE PR Column Distributions | REFEREN | VCE | | | | | | CROSS Row Dis | TABS: S stribution | LE PRE | EFEREN | CE | | |
|--|-------------|--------------|------------------------------|--------|------------------------|-------------------------|----------------|------------------|-----------------------|------------------------------|--------|------------------------|-------------------------|----------------|
| Catch Disposition $p < .001$ | Great Lakes | səyer publik | Inland Lakes and Great Lakes | Rivers | Rivers and Great Lakes | Rivers and Inland Lakes | səibodrəsı IIA | Great Lakes | səyer ruful | Inland Lakes and Great Lakes | Rivers | Rivers and Great Lakes | Rivers and Inland Lakes | səibod1918 WIA |
| Keep and Release Some | 33.7% | 33.4% | 36.1% | 26.8% | 41.5% | 35.0% | 43.8% | 11.4% | 32.2% | 10.5% | 5.8% | 4.2% | 15.7% | 20.2% |
| Catch and Release | 14.4% | 38.9% | 25.1% | 46.9% | 27.3% | 41.0% | 30.2% | 5.1% | 39.5% | 7.7% | 10.7% | 2.9% | 19.4% | 14.6% |
| Mostly keep my catch | 51.9% | 27.7% | 38.8% | 26.3% | 31.3% | 24.0% | 26.0% | 20.1% | 30.7% | 12.9% | 6.5% | 3.7% | 12.4% | 13.7% |

| CROSSTABS: AGE FIRS1 | F FISHED | "Recrui | tment" | | | | | CROSS | TABS: / | VGE FI | RST FIS | HED | | |
|------------------------------|----------|---------|-----------|----------|----------|----------|---------|--------|----------------|---------------|----------|----------|----------|---------|
| Column Distributions | | | | | | | | Row Di | stributio | ns | i | | | |
| Catch Disposition $p < .001$ | 2 ot 0 | 01 01 9 | \$1 01 [] | 02 ot 91 | 52 of 12 | 0E 01 92 | snjd O£ | č 01 0 | 01 ot 9 | č1 ot 11 | 02 01 91 | 52 of 12 | 0E 01 92 | sulq 0£ |
| Keep some, release some | 36.6% | 34.2% | 39.3% | 32.1% | 29.4% | 18.5% | 39.4% | 48.2% | 41.1% | 5.9% | 1.5% | 0.8% | 0.3% | 2.1% |
| Mostly catch and release | 35.3% | 33.3% | 22.5% | 28.6% | 33.3% | 29.6% | 26.6% | 49.4% | 42.6% | 3.6% | 1.4% | 1.0% | 0.5% | 1.5% |
| Mostly keep my catch | 28.1% | 32.5% | 38.2% | 39.3% | 37.3% | 51.9% | 34.0% | 42.3% | 44.7% | 6.6% | 2.1% | 1.2% | 0.9% | 2.1% |
| | | | | | | | | | | | | | | |
| CDOCCTARS, FIGUING F | VENT | | | | 20000 | TADC. F | UNINSI | TNAVA | | Γ | | | | |

| CROSSTABS: FISHING EV | /ENT | | CROSSTABS: FISHIN | NG EVENT |
|------------------------------|---------------------|----------------------|--------------------------|-------------------|
| Column Distributions | | | Row Distributions | |
| Catch Disposition $p < .001$ | Fishing Event No | Fishing Event Yes | Fishing Event No | Fishing Event Yes |
| Keep some, release some | 35.6% | 34.6% | 94.8% | 5.2% |
| Mostly catch and release | 33.7% | 31.9% | 94.9% | 5.1% |
| Mostly keep my catch | 30.8% | 33.5% | 94.2% | 5.8% |
| | | | | |

| CROSSTABS: HOUSEHOL | D STRUCTURE | | CROSSTABS: HOUS | EHOLD STRUCTURE |
|------------------------------|-------------------|-----------------|--------------------------|-----------------|
| Column Distributions | | | Row Distributions | |
| Catch Disposition $p < .001$ | Children ≤ 5 | Children 6 - 17 | Children ≤ 5 | Children 6 - 17 |
| Keep some, release some | 33.3% | 35.4% | 9.6% | 25.9% |
| Mostly catch and release | 42.4% | 36.8% | 13.1% | 28.7% |
| Mostly keep my catch | 24.3% | 27.8% | 8.1% | 23.3% |
| | | | | |
| CPOSSTARS. CENDER | | | CPOSSTARS, GEND | E D |

| CROSSTABS: GENDER | | | CROSSTABS: GENDE | ~ |
|-----------------------------|--------|-------|--------------------------|-------|
| Column Distributions | | | Row Distributions | |
| Catch Disposition p < .001 | Female | Male | Female | Male |
| Keep some, release some | 35.2% | 35.7% | 21.7% | 78.3% |
| Mostly catch and release | 31.1% | 34.0% | 20.5% | 79.6% |
| Mostly keep my catch | 33.8% | 30.3% | 23.9% | 76.1% |

| CROSSTABS: INCOME | | | | | | | CROSS1 | TABS: INC | COME | | | |
|------------------------------|-----------------------|-------------------|-------------------|---------------------------------------|--------------------|-----------------------|-----------------|-------------------|-------------------|-------------------|---------------------|-------------------|
| Column Distributions | | | | | | | Row Dist | tributions | | | | |
| Catch Disposition $p < .001$ | 80- 54,999 | \$52,000 - 49,999 | 666'†/ - 000'05\$ | 666'66 ⁻ 000'S <i>L</i> \$ | 666,641 - 000,0018 | \$150,000 or more | 80- 54,999 | \$52,000 - 49,999 | 666'†⁄ - 000'05\$ | 666'66 - 000'SL\$ | 666'671 - 000'001\$ | \$150,000 or more |
| Keep some, release some | 38.3% | 38.2% | 36.9% | 35.1% | 29.6% | 25.3% | 16.87% | 29.4% | 25.2% | 14.3% | 9.5% | 4.7% |
| Mostly catch and release | 28.2% | 27.5% | 32.2% | 35.7% | 47.1% | 52.0% | 13.06% | 22.3% | 23.2% | 15.3% | 15.9% | 10.2% |
| Mostly keep my catch | 33.5% | 34.4% | 30.9% | 29.2% | 23.3% | 22.6% | 17.14% | 30.8% | 24.5% | 13.9% | 8.7% | 4.9% |
| | | | | | | | | | | | | |
| CROSSTABS: EDUCATIC | N | | | | | CROSS | FABS: ED | UCATIO | Z | - | | |
| Column Distributions | | | | | | Row Dis | tributions | | | | | |
| Catch Disposition $p < .001$ | nan High Degree or | sehool Degree | dgiH 120q | lor's Degree | ate Degree | nan High Degree or | school Degree | dgiH 120q | lor's Degree | ate Degree | | |

| URUSSIABS: EDUCATIC | | | | | | CKOSS | ABS: E | NUCAL | 5 | |
|------------------------------|---|--------------------|--------------------------|-------------------|-----------------|---|--------------------|--------------------------|-------------------|-----------------|
| Column Distributions | | | | | | Row Dis | tribution | s | | |
| Catch Disposition $p < .001$ | GED School Degree or Less than High | High School Degree | Some post High School | Bachelor's Degree | Graduate Degree | Less than High School Degree or GED | ээтдэС Іоолэ2 ядіН | Some post High School | Bachelor's Degree | Graduate Degree |
| Keep some, release some | 5.9% | 27.9% | 39.3% | 17.9% | 0.0% | 37.3% | 38.1% | 37.6% | 33.1% | 27.3% |
| Mostly catch and release | 4.1% | 20.0% | 35.9% | 23.7% | 16.3% | 24.3% | 25.6% | 32.2% | 41.1% | 46.3% |
| Mostly keep my catch | 6.9% | 30.6% | 36.4% | 16.1% | 10.1% | 38.4% | 36.3% | 30.2% | 25.8% | 26.4% |
| mostly keep my catch | 0.7%0 | 0/0.05 | 30.4% | 10.1% | 10.1% | 0/4.90 | 0/2.00 | | 0/.7.00 | 0/2.02 0/2.02 |

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| CROSSTABS: EMPLOYM Column Distributions | ENT | | | | | CROSS Row Dis | TABS: E | Sup Loy | MENT | | r | |
|--|----------------------|-----------|------------|-------------|-----------|----------------------|-----------|----------|---------------|-------|-----------|-------|
| Catch Disposition $p < .001$ | Employed Fulltime | Part-time | Retired | Da-employed | Other | Fulltime Employed | Part-time | Retired | b∍yolqmэ-nU | Other | . | |
| Keep some, release some | 35.0% | 35.3% | 36.9% | 35.6% | 34.3% | 54.8% | 7.1% | 28.39 | 6 5.1% | 4.7% | | |
| Mostly catch and release | 37.9% | 32.2% | 25.5% | 33.2% | 32.2% | 62.7% | 6.9% | 20.79 | 6 5.1% | 4.6% | | |
| Mostly keep my catch | 27.1% | 32.5% | 37.7% | 31.2% | 33.5% | 48.8% | 7.5% | 33.39 | 6 5.2% | 5.2% | | |
| | | | | | | | | | | | | |
| CROSSTABS: AGE | | | | | | | CROSS | TABS: A | GE | | | |
| Column Distributions | | | | | | | Column | Distribu | itions | | | |
| Catch Disposition $p < .001$ | çz ueyi | 46 | 4 4 | 45 | 79 | sn | than 25 | 46 | 44 | 45 | 79 | sn |
| | ssəJ | 01 SZ | ot 2£ | oj 24 | ot čč | d 59 | ssəJ | o1 62 | 01 S E | oj 24 | ot čč | d ç9 |
| Keep some, release some | 34.8% | 33.3% | 34.3% | 38.3% | 36.4% | 34.1% | 6.9% | 11.6% | 15.5% | 25.8% | 22.7% | 17.6% |
| Mostly catch and release | 38.5% | 43.8% | 40.6% | 31.0% | 30.7% | 24.5% | 8.1% | 16.2% | 19.5% | 22.3% | 20.4% | 13.5% |
| Mostly keep my catch | 26.7% | 22.9% | 25.2% | 30.8% | 32.9% | 41.5% | 6.1% | 9.1% | 13.0% | 23.8% | 23.5% | 24.6% |

| CROSSTABS: FISHING EVENT PARTICI | PATION | | CROSSTABS: FISHING | EVENT PARTICIPATION |
|---|----------|-----------|--------------------------|---------------------|
| Column Distributions | | | Row Distributions | |
| Age First Fished "Recruitment" p < .001 | Event No | Event Yes | Event No | Event Yes |
| 0 to 5 | 46.5% | 58.4% | 93.2% | 6.8% |
| 6 to 10 | 42.7% | 36.0% | 95.3% | 4.7% |
| 11 to 15 | 5.6% | 3.0% | 97.0% | 3.0% |
| 16 to 20 | 1.6% | 0.4% | 98.7% | 1.3% |
| 21 to 25 | 1.1% | 0.4% | 98.0% | 2.0% |
| 26 to 30 | 0.5% | 1.1% | 88.5% | 11.5% |
| 30 plus | 2.0% | 0.8% | 97.9% | 2.1% |
| CROSSTABS: GENDER | | | CROSSTABS: GENDER | |
| Column Distributions | | | Row Distributions | |
| Age First Fished "Recruitment" p < .001 | Female | Male | Female | Male |
| 0 to 5 | 42.3% | 47.7% | 19.9% | 80.2% |
| 6 to 10 | 38.8% | 43.9% | 19.8% | 80.2% |
| 11 to 15 | 7.5% | 4.9% | 30.0% | 70.0% |
| 16 to 20 | 3.7% | 1.1% | 48.2% | 51.8% |
| 21 to 25 | 3.2% | 0.5% | 64.8% | 35.2% |
| 26 to 30 | 0.9% | 0.4% | 37.0% | 63.0% |
| 30 plus | 3.6% | 1.4% | 41.7% | 58.3% |

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| APPENDIX E #3 SPSS Statistics 17 |

| CDOSCTARS, INCOME | | | | | | | CDOSC | LA BC. IN | JMOO | | | |
|---|-----------------------------|-------------------|---|-----------------------|--------------------------|-------------------|-------------------|---|-----------------------|----------------------------|---------------------|-------------------|
| Column Distributions | | | | | | | Row Dis | tribution | s | | | |
| Age First Fished "Recruitment" <i>p</i> < .001 | 666' †7 -0 \$ | \$22'000 - 46'666 | 666'72 - 000'05\$ | 666'66 - 000'5/\$ | 666'671 - 000'001\$ | \$150,000 or more | 80- 54'666 | \$22,000 - 49,999 | 666'7⁄ - 000'05\$ | 666'66 - 000'S / \$ | 666'6†1 - 000'001\$ | \$150,000 or more |
| 0 to 5 | 42.0% | 44.4% | 47.6% | 49.8% | 52.0% | 54.3% | 14.0% | 25.8% | 24.7% | 15.4% | 12.5% | 7.6% |
| 6 to 10 | 44.4% | 44.0% | 43.2% | 40.7% | 40.5% | 38.6% | 16.4% | 28.3% | 24.8% | 13.9% | 10.8% | 5.9% |
| 11 to 15 | 6.3% | 6.2% | 4.8% | 5.1% | 4.6% | 2.4% | 18.7% | 32.3% | 22.1% | 14.0% | 9.8% | 3.0% |
| 16 to 20 | 3.0% | 1.8% | 1.3% | 1.2% | 0.8% | 1.4% | 28.8% | 30.1% | 19.2% | 11.0% | 5.5% | 5.5% |
| 21 to 25 | 1.3% | 1.2% | 0.6% | 1.2% | 0.4% | 0.7% | 20.9% | 34.9% | 16.3% | 18.6% | 4.7% | 4.7% |
| 26 to 30 | 0.7% | 0.5% | 0.5% | 0.3% | 0.4% | 1.7% | 20.0% | 24.0% | 20.0% | 8.0% | 8.0% | 20.0% |
| 30 plus | 2.3% | 1.9% | 2.0% | 1.7% | 1.4% | 1.0% | 19.5% | 28.1% | 26.8% | 13.4% | 8.5% | 3.7% |
| | | | | | | | | | T A DC. T | | | |
| CKUSSIABS: EDUCALI | | | | | | | | CKOS | 1 4 P 2: I | SUUCAI | | |
| Column Distributions | | | | | | | | Row D | istributio | Su | | |
| Age First Fished "Recruit | tment" p | <.001 | GED School Degree or Band Degree or | High School Degree | Some post High School | Bachelor's Degree | Graduate Degree | Less than High School Degree or GED | High School Degree | Some post High | Bachelor's Degree | Graduate Degree |
| 0 to 5 | | | 42.0% | 39.3% | 51.1% | 49.3% | 46.4% | 4.9% | 22.1% | 6 41.0 | % 20.3 | % 11.7% |
| 6 to 10 | | | 44.6% | 47.6% | 38.7% | 43.1% | 44.5% | 5.6% | 29.1% | 6 33.8 | % 19.3 | % 12.2% |
| 11 to 15 | | | 6.0% | 6.4% | 5.9% | 3.4% | 4.6% | 6.0% | 31.1% | 6 40.8 | % 12.0 | % 10.1% |
| 16 to 20 | | | 2.6% | 2.0% | 1.5% | 1.3% | 1.2% | 8.9% | 32.9% | 6 34.2 | % 15.2 | % 8.9% |
| 21 to 25 | | | 2.3% | 1.6% | 0.9% | 0.7% | 0.5% | 11.3% | 39.6% | 6 30.2 | % 13.2 | % 5.7% |
| 26 to 30 | | | 1.5% | 0.4% | 0.5% | 0.4% | 0.9% | 14.8% | 18.5% | 6 33.3 | % 14.8 | % 18.5% |
| 30 plus | | | 1.1% | 2.7% | 1.5% | 1.8% | 1.9% | 3.2% | 37.6% | 6 29.0 | % 18.3 | % 11.8% |

APPENDIX E #4 SPSS Statistics 17.0® crosstabulations, site preference

| CROSSTABS: FISHING | FREQ | UENCI | | | | | | CRC | SSTABS | S: FISHIN | NG FRE | QUENCY | | |
|-------------------------------|---------|--------|--------------|--------------|--------------|----------------|---------------------|---------|----------|--------------|--------------|--------------|----------------|---------------------|
| Column Distributions | | | | | | | | Row | Distribu | tions | | | | |
| Site Preference <i>p</i> <001 | səmit 0 | l time | 2 or 3 times | 4 or 5 times | səmit 9 ot ð | 20 to 19 times | 20 or more times | səmit 0 | əmit I | 2 or 3 times | 4 or 5 times | səmit 9 ot ð | 20 to 16 times | 20 or more times |
| Rivers | na | 4.6% | 10.4% | 13.9% | 13.3% | 19.2% | 38.6% | na | 23.6% | 28.1% | 39.4% | 38.8% | 48.1% | 61.0% |
| Inland Lakes | na | 6.0% | 14.6% | 15.0% | 15.6% | 18.2% | 30.6% | na | 54.3% | 69.4% | 74.8% | 80.5% | 80.1% | 85.0% |
| Great Lakes | na | 5.5% | 11.6% | 13.1% | 14.3% | 19.3% | 36.2% | na | 27.2% | 30.4% | 35.9% | 40.6% | 46.7% | 55.2% |

| CROSSTABS: SOCIAL (| GROUPS | | | | CROSSTABS | SOCIAL | GROUPS | |
|-----------------------------|-----------|---------|--------|-------|---------------------|---------|--------|-------|
| Column Distributions | | | | | Row Distribu | tions | | |
| Sito Duofoundo a / M1 | Family / | Eriande | No one | Othor | Family / | Eriande | No | Othor |
| $100 \times b$ | relatives | | | Onici | relatives | | one | Ould |
| Rivers | 24.2% | 28.9% | 34.1% | 31.4% | 37.2% | 49.7% | 52.6% | 54.4% |
| Inland Lakes | 51.3% | 42.2% | 44.9% | 43.8% | 79.0% | 72.5% | 69.3% | 76.0% |
| Great Lakes | 24.5% | 29.0% | 21.0% | 24.8% | 37.7% | 48.9% | 32.4% | 43.0% |

| CROSSTABS: BOAT OW | /NERSHIP | | CROSSTABS: BOA | FOWNERSHIP | _ |
|---------------------------------|----------|----------|--------------------------|-------------------|---|
| Column Distributions | | | Row Distributions | | |
| Site Preference <i>p</i> < .001 | Boat No | Boat Yes | Boat No | Boat Yes | |
| Rivers | 29.8% | 25.3% | 44.8% | 43.0% | |
| Inland Lakes | 45.7% | 47.9% | 68.8% | 81.5% | |
| Great Lakes | 24.5% | 26.8% | 36.9% | 45.6% | |

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| CROSSTABS: INCOME | | | | | | | CROSST | TABS: IN | NCOME | | | |
|---|-------------------------|-------------------------------|-------------------|-------------------------|---------------------|----------------------|-------------------------|-------------------------------|-------------------|----------------------------|---------------------|-------------------|
| Column Distributions | | | | | | | Row Dist | tribution. | s | | | |
| Site Preference $p < .001$ | \$0 - 54'666 | \$52'000 - 4 6'666 | 666'†/ - 000'05\$ | 666°66 - 000°52\$ | 666'6†1 - 000'001\$ | \$150,000 or more | \$0 - 54'666 | \$52'000 - 4 6'666 | 666'7/ - 000'05\$ | 666'66 - 000' <i>SL</i> \$ | 666'671 - 000'001\$ | \$150,000 or more |
| Rivers | 32.4% | 28.2% | 26.1% | 24.2% | 25.2% | 26.0% | 52.1% 4 | 46.5% | 43.5% | 40.6% | 40.7% | 41.0% |
| Inland Lakes | 49.2% | 47.2% | 45.9% | 46.8% | 47.3% | 43.7% | 79.3% | %6°LL | 76.3% | 78.4% | 76.4% | 68.9% |
| Great Lakes | 18.4% | 24.7% | 28.0% | 29.0% | 27.5% | 30.7% | 29.7% | 40.8% | 46.6% | 48.7% | 44.3% | 47.7% |
| CROSSTABS: EMPLOY Column Distributions | MENT | | | | | CROS Row I | STABS: 1 | EMPLO' | YMENT | | | |
| Site Preference $p < .001$ | Employed Fulltime | Part-time | Retired | pəxolqmə-n ^U | Other | Employed Fulltime | Part-time | Retired | pəxolqmə-nU | Other | | |
| Rivers | 26.6% | 29.7% | 24.5% | 32.7% | 29.1% | 44.8% | 50.3% | 36.1% | 55.59 | 6 47.8 | 0% | |
| Inland Lakes | 46.0% | 46.6% | 50.6% | 45.2% | 47.9% | 77.3% | 78.9% | 74.5% | 76.89 | 6 78.7 | % | |
| Great I abas | 707 20 | 702 20 | 700 10 | 700 CC | 22 00/2 | 16 10/ | 700 01 | 26 60/2 | 27 40 | 27.9 | 10 | |

| CROSSTABS: EDUCAT | NOI | | | | | | CROS Row D | STABS: Vistributi | EDUC | ATION | | | | |
|---------------------------------|---------------------------------|---------------|---------------|------------------------------|-------------------|-----------------|---------------------------------|----------------------|---------------|--------------------------|------------------|-------------------|-----------------|------------------|
| Site Preference $p < .001$ | Less than High School Devree | High School | degree or GED | School Some post माष्ट्री | Bachelor's Degree | Graduate Degree | Less than High School Degree | High School | degree or GED | Some post High School | corrol pholodood | Bachelor's Degree | Graduate Degree | |
| Rivers | 30.19 | <u>6 27.5</u> | 5% 26 | 5.4% | 25.5% | 27.3% | 48.9% | 6 43.2 | % | 44.3% | 41. | 5% 4 | 43.2% | |
| Inland Lakes | 48.19 | 6 49.4 | 1% 46 | 5.4% | 46.5% | 45.6% | 78.1% | 6 77.5 | % | 77.8% | 75. | . %9 | 72.3% | |
| Great Lakes | 21.89 | 6 23.1 | 1% 27 | 7.1% | 28.0% | 27.1% | 35.4% | 6 36.2 | % | 45.5% | 45. | 5% 4 | 43.0% | |
| CROSSTABS: FISHING | FREO | UENCY | | | | | | CROSS | TABS: | FISHIN | G FREC | DUENC | | |
| Column Distributions | | | | | | | | Dow Die | | | | | | |
| Column Distributions | | | | | | | | | Inding | Suc | | | | |
| Site Preference <i>p</i> < .001 | 0 times | l time | 2 or 3 times | 4 or 5 times | səmit 9 to 9 | 10 to 15 times | 20 or more times | 0 times | 1 time | 2 or 3 times | 4 or 5 times | səmit 9 ot ð | səmit 91 ot 01 | 20 or more times |
| Great Lakes | na | 24.8% | 16.6% | 12.2% | 9.6% | 9.9% | 7.9% | na 17 | 1.5% 2 | 2.4% | 15.6% | 11.9% | 14.4% | 18.17% |
| Inland Lakes | na | 50.0% | 47.2% | 37.5% | 36.3% | 29.6% | 21.7% | na 12 | .4% 2 | 2.3% | 16.9% | 15.8% | 15.1% | 17.51% |
| Inland Lakes & Great Lakes | na | 1.7% | 8.1% | 11.0% | 15.3% | 12.4% | 9.4% | na I. | .4% 1 | 2.8% | 16.6% | 22.4% | 21.2% | 25.60% |
| Rivers | na | 20.2% | 11.1% | 8.8% | 6.6% | 4.9% | 3.3% | na 22 | 2.5% 2 | 23.6% | 17.7% | 12.9% | 11.3% | 12.06% |
| Rivers & Great Lakes | na | 0.7% | 2.9% | 4.2% | 3.4% | 5.0% | 3.8% | na l | .7% 1 | 3.0% | 18.1% | 14.1% | 24.3% | 28.81% |
| Rivers & Inland Lakes | na | 2.6% | 11.3% | 17.8% | 16.5% | 18.8% | 19.8% | na l | .4% 1 | 1.5% | 17.1% | 15.4% | 20.5% | 34.14% |
| All Waterbodies | na | 0.0% | 2.8% | 8.5% | 12.3% | 19.3% | 34.1% | na 0. | .0% | 2.7% | 8.0% | 11.2% | 20.5% | 57.59% |

| CROSSTABS: SOCIAL GR Column Distributions | SOUPS | | | | CROSS' Row Dis | FABS: SO tributions | CIAL GR | SAUO |
|--|--------------------|---------|----------|-------|--------------------|-------------------------------|----------|-------|
| Site Preference $p < .001$ | Family / relatives | Friends | ano oN | Other | Family / relatives | Friends | ano oN | Other |
| Great Lakes | 11.4% | 14.4% | 9.5% | 10.1% | 56.4% | 36.4% | 5.6% | 1.6% |
| Inland Lakes | 40.4% | 26.0% | 32.7% | 25.3% | 69.1% | 22.8% | 6.7% | 1.34% |
| Inland Lakes & Great Lakes | 11.0% | 10.0% | 5.6% | 10.1% | 64.5% | 29.8% | 3.9% | 1.83% |
| Rivers | 6.7% | 8.4% | 16.0% | 11.4% | 50.3% | 32.5% | 14.5% | 2.66% |
| Rivers & Great Lakes | 2.9% | 4.7% | 5.2% | 2.5% | 48.7% | 39.6% | 10.4% | 1.30% |
| Rivers & Inland Lakes | 15.2% | 15.7% | 19.0% | 20.3% | 58.2% | 30.7% | 8.7% | 2.40% |
| All Waterbodies | 12.3% | 20.9% | 12.1% | 20.3% | 49.1% | 42.7% | 5.8% | 2.50% |
| | | | | | | | | |
| CROSSTABS: BOAT OWN | IERSHIP | | | CRO | SSTABS: | BOAT O | WNERSH | đ |
| Column Distributions | | | | Row | Distributi | ons | | |
| Site Preference $p < .001$ | Boat N | 0 | Boat Yes | | soat No | | soat Yes | |
| Great Lakes | 13.1% | | 11.5% | | 41.1% | | 59.0% | |
| Inland Lakes | 33.6% | - | 34.5% | | 37.3% | | 62.7% | |
| Inland Lakes & Great Lakes | 8.6% | | 11.1% | | 32.2% | | 67.8% | |
| Divers | 12 60/ | | 2 002 | | 702 23 | | 37 20% | |

| CROSSTABS: BOAT OW | VERSHIP | | CROSSTABS: BO / | VT OWNERS |
|-------------------------------|---------|----------|--------------------------|------------------|
| Column Distributions | | | Row Distributions | |
| Site Preference $p < .001$ | Boat No | Boat Yes | Boat No | Boat Yes |
| Great Lakes | 13.1% | 11.5% | 41.1% | 59.0% |
| Inland Lakes | 33.6% | 34.5% | 37.3% | 62.7% |
| Inland Lakes & Great Lakes | 8.6% | 11.1% | 32.2% | 67.8% |
| Rivers | 13.6% | 3.9% | 67.7% | 32.3% |
| Rivers & Great Lakes | 4.6% | 3.1% | 47.5% | 52.5% |
| Rivers & Inland Lakes | 16.0% | 16.0% | 38.0% | 62.0% |
| All Waterbodies | 10.6% | 19.9% | 24.5% | 75.5% |

| CROSSTABS: INCOME | | | | | | | CROSS | TABS: II | NCOME | | | |
|-------------------------------|--------------------------------|-------------------|------------------------------|--|---------------------|-------------------|-------------------|---------------------------|-------------------|------------------------------|---------------------|-------------------|
| COUMIN DISCRIDUTIONS | | | | | | | Kow Dis | tributio | SI | | | |
| Site Preference <i>p</i> <001 | 80- 54 [,] 666 | 666'6† - 000'57\$ | 666'7L ⁻ 000'0S\$ | 666'66 ⁻ 000' <i>\$L</i> \$ | 666'671 - 000'001\$ | \$150,000 or more | 80- 54'666 | 666'67 - 000'5 2\$ | 666'7L - 000'0S\$ | 666'66 ⁻ 000'SL\$ | 666'671 - 000'001\$ | \$150,000 or more |
| Great Lakes | 7.1% | 11.1% | 13.8% | 13.0% | 13.0% | 14.8% | 9.3% | 25.8% | 28.3% | 15.9% | 12.6% | 8.1% |
| Inland Lakes | 36.2% | 33.0% | 32.5% | 32.9% | 34.5% | 31.8% | 16.8% | 27.2% | 23.6% | 14.3% | 11.8% | 6.2% |
| Inland Lakes & Great Lakes | 4.6% | 9.4% | 10.3% | 13.6% | 11.8% | 12.4% | 7.2% | 26.1% | 25.2% | 19.9% | 13.6% | 8.1% |
| Rivers | 10.8% | 7.6% | 6.4% | 5.5% | 6.8% | 9.2% | 22.3% | 27.8% | 20.8% | 10.7% | 10.4% | 8.0% |
| Rivers & Great Lakes | 2.8% | 3.4% | 3.5% | 3.2% | 3.8% | 7.1% | 12.2% | 26.3% | 23.7% | 12.8% | 12.2% | 12.8% |
| Rivers & Inland Lakes | 23.3% | 18.6% | 14.5% | 13.0% | 14.4% | 11.3% | 21.9% | 30.9% | 21.4% | 11.4% | 10.0% | 4.4% |
| All Waterbodies | 15.2% | 16.9% | 19.1% | 19.0% | 15.6% | 13.4% | 13.9% | 27.2% | 27.2% | 16.2% | 10.5% | 5.1% |

| CROSSTABS: EMPLOY Column Distributions | MENT | | | | | CROSS Row Dis | TABS: I stributio | EMPLON IIS | MENT | |
|---|----------------------|-----------|---------|-------------------------|-------|----------------------|----------------------|---------------|-------------|-------|
| Site Preference <i>p</i> <001 | Employed Fulltime | Part-time | Retired | p∍∢olqmэ-n ^U | Other | Fmployed Employed | Part-time | Retired | Da∙employed | Other |
| Great Lakes | 12.5% | 8.7% | 12.8% | 8.3% | 13.0% | 58.1% | 5.2% | 28.0% | 3.6% | 5.2% |
| Inland Lakes | 31.4% | 33.8% | 41.5% | 29.1% | 32.6% | 51.6% | 7.1% | 32.2% | 4.5% | 4.6% |
| Inland Lakes & Great Lakes | 11.4% | 7.2% | 9.7% | 7.1% | 6.5% | 62.9% | 5.1% | 25.3% | 3.7% | 3.1% |
| Rivers | 6.6% | 9.0% | 8.9% | 10.6% | 6.5% | 48.8% | 8.5% | 31.2% | 7.4% | 4.1% |
| Rivers & Great Lakes | 3.6% | 3.5% | 3.8% | 4.3% | 1.7% | 56.1% | 6.9% | 28.3% | 6.4% | 2.3% |
| Rivers & Inland Lakes | 16.0% | 17.1% | 13.0% | 22.8% | 23.0% | 56.3% | 7.7% | 21.6% | 7.6% | 6.9% |
| All Waterbodies | 18.6% | 20.8% | 10.3% | 17.7% | 16.5% | 63.7% | 9.1% | 16.6% | 5.7% | 4.8% |

| CROSSTABS: EDUCATIO | z | | | | | CROS | STABS: | EDUCAT | LION | |
|-----------------------------|---------------------------------|------------------------------|----------------------------------|-------------------|-----------------|---------------------------------|------------------------------|--------------------------|-------------------|-----------------|
| Column Distributions | | | | | | Row D | istributio | SUG | | |
| Site Preference p <,001 | Less than High School Degree | High School degree or GED | Some post High Some post High | Bachelor's Degree | Graduate Degree | Less than High School Degree | High School degree or GED | Some post High School | Bachelor's Degree | Graduate Degree |
| Great Lakes | 9.6% | 10.9% | 12.9% | 12.6% | 12.9% | 4.3% | 23.2% | 39.9% | 20.1% | 12.5% |
| Inland Lakes | 35.4% | 37.7% | 32.0% | 33.8% | 33.2% | 5.6% | 28.7% | 35.1% | 19.3% | 11.4% |
| Inland Lakes & Great Lakes | 6.2% | 8.4% | 10.8% | 12.1% | 10.8% | 3.3% | 21.4% | 39.8% | 23.1% | 12.5% |
| Rivers | 9.2% | 8.2% | 5.5% | 8.1% | 11.5% | 6.5% | 28.0% | 27.2% | 20.7% | 17.7% |
| Rivers & Great Lakes | 3.1% | 3.4% | 3.7% | 3.7% | 3.4% | 4.7% | 25.0% | 39.0% | 20.4% | 11.1% |
| Rivers & Inland Lakes | 20.0% | 17.9% | 17.0% | 12.6% | 12.4% | 6.7% | 29.0% | 39.9% | 15.3% | 9.1% |
| All Waterbodies | 16.5% | 13.6% | 18.1% | 17.1% | 16.1% | 5.4% | 21.5% | 41.3% | 20.2% | 11.5% |

APPENDIX E #5 SPSS Statistics 17.0® crosstabulations, fishing frequency

| CROSSTABS: SOCIAL GR | SAUO | | | | CROSST | ABS: SOC | SIAL GRO | SdD |
|-----------------------------------|-----------------------|---------|--------|-------|-----------------------|-----------|-----------------|-------|
| Column Distributions | | | | | Row Dist | ributions | | |
| Fishing Frequency <i>p</i> < .001 | Family / relatives | Friends | No one | Other | Family / relatives | Friends | No one | Other |
| 0 times | 3.6% | 3.5% | 6.2% | 3.6% | 57.6% | 28.5% | 12.1% | 1.8% |
| l time | 8.9% | 9.1% | 5.0% | 3.6% | 62.3% | 32.6% | 4.3% | 0.8% |
| 2 or 3 times | 18.0% | 13.8% | 9.9% | 14.5% | 67.2% | 26.5% | 4.6% | 1.71% |
| 4 or 5 times | 16.2% | 14.0% | 13.7% | 14.5% | 63.4% | 28.3% | 6.6% | 1.8% |
| 6 to 9 times | 15.9% | 11.7% | 14.0% | 14.5% | 66.1% | 24.9% | 7.1% | 1.9% |
| 10 to 19 times | 16.7% | 16.2% | 16.78% | 14.5% | 60.6% | 30.3% | 7.5% | 1.7% |
| 20 plus | 20.7% | 31.8% | 34.5% | 34.9% | 48.9% | 38.5% | 10.0% | 2.6% |

| CROSSTABS: HOUSEHOL Column Distributions | D STRUC | TURE | | CROSST Row Dist | ABS: HOUSEH | OLD STRUCTURE | _ |
|---|---------|-------------------|------------------|--------------------|-------------------|------------------|---|
| Fishing Frequency $p < .005$ | Spouse | Children ≤ 5 | Children 6 to 17 | Spouse | Children ≤ 5 | Children 6 to 17 | |
| 0 times | 3.9% | 1.8% | 1.7% | 85.4% | 5.1% | 12.4% | T |
| 1 time | 8.3% | 5.4% | 7.0% | 78.9% | 6.9% | 22.3% | _ |
| 2 or 3 times | 15.8% | 12.8% | 15.9% | 78.0% | 8.4% | 26.6% | |
| 4 or 5 times | 15.2% | 14.6% | 14.3% | 79.1% | 10.1% | 25.1% | |
| 6 to 9 times | 14.6% | 16.7% | 15.0% | 78.3% | 11.9% | 27.1% | - |
| 10 to 19 times | 17.1% | 18.5% | 17.9% | 79.0% | 11.3% | 27.8% | |
| 20 plus | 25.1% | 30.3% | 28.2% | 72.7% | 11.7% | 27.5% | _ |

| CROSSTABS: Fishing Event | Participation | | CROSSTABS: Fishing | g Event Participation |
|-----------------------------------|---------------|--------------|---------------------------|-----------------------|
| Column Distributions | | | Row Distributions | |
| Fishing Frequency <i>p</i> < .001 | Event No | Event Yes | Event No | Event Yes |
| 0 times | na | na | na | na |
| 1 time | 8.9% | 3.0% | 98.1% | 1.9% |
| 2 or 3 times | 17.0% | 3.4% | 98.9% | 1.1% |
| 4 or 5 times | 15.8% | 7.1% | 97.5% | 2.5% |
| 6 to 9 times | 15.4% | 7.1% | 97.4% | 2.6% |
| 10 to 19 times | 17.5% | 15.7% | 95.1% | 4.9% |
| 20 plus | 25.4% | 63.8% | 87.3% | 12.7% |
| CROSSTABS: Residency | | | CROSSTABS: Reside | ncy |
| Column Distributions | | | Row Distributions | |
| Fishing Frequency <i>p</i> < .001 | Resident No | Resident Yes | Resident No | Resident Yes |
| 0 times | 2.4% | 3.9% | 11.9% | 88.1% |
| 1 time | 23.9% | 4.7% | 52.4% | 47.6% |
| 2 or 3 times | 27.0% | 13.2% | 30.9% | 69.1% |
| 4 or 5 times | 17.8% | 14.2% | 21.5% | 78.5% |
| 6 to 9 times | 13.0% | 14.7% | 16.1% | 83.9% |
| 10 to 19 times | 8.4% | 18.5% | 9.0% | 91.1% |
| 20 plus | 7.6% | 30.8% | 5.1% | 94.9% |

| CROSSTABS: Boat Ownershi Column Distributions | đ | | CROSSTABS: Boat C Row Distributions |)wnership | |
|--|---------|----------|--|-----------|---|
| Fishing Frequency <i>p</i> < .001 | Boat No | Boat Yes | Boat No | Boat Yes | |
| 0 times | 4.9% | 2.6% | 53.4% | 46.6% | |
| 1 time | 13.3% | 5.0% | 62.2% | 37.8% | |
| 2 or 3 times | 21.9% | 11.7% | 53.9% | 46.1% | |
| 4 or 5 times | 17.6% | 13.2% | 45.4% | 54.6% | |
| 6 to 9 times | 14.1% | 14.6% | 37.6% | 62.5% | |
| 10 to 19 times | 13.0% | 19.0% | 30.0% | 70.0% | |
| 20 plus | 15.2% | 33.8% | 21.9% | 78.1% | |
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| CROSSTABS: Gender Column Distributions | | | CROSSTABS: Gender Row Distributions | |
|---|--------|-------|--|-------|
| Fishing Frequency $p < .001$ | Female | Male | Female | Male |
| 0 times | 3.4% | 3.7% | 20.5% | 79.5% |
| 1 time | 9.5% | 7.8% | 25.4% | 74.6% |
| 2 or 3 times | 18.9% | 14.7% | 26.4% | 73.6% |
| 4 or 5 times | 18.5% | 13.8% | 27.2% | 72.8% |
| 6 to 9 times | 15.6% | 14.0% | 23.7% | 76.3% |
| 10 to 19 times | 15.7% | 17.0% | 20.5% | 79.5% |
| 20 plus | 18.4% | 29.0% | 15.1% | 85.0% |

| CROSSTABS: EMPLOY | MENT | | | | | CROSS | TABS: | EMPLO | YMENT | |
|---------------------------------|-------------------|-----------|---------|-------------|-------|-------------------|-----------|---------|-----------|-------|
| Column Distributions | | | | | | Row Di | stributic | SUC | | |
| Site Preference <i>p</i> < .001 | Employed Fulltime | Part-time | Retired | Un-employed | Other | Employed Fulltime | Part-time | Retired | Dayoloyed | Other |
| 0 times | 2.4% | 3.9% | 5.8% | 3.5% | 3.4% | 38.1% | 8.0% | 44.3% | 5.1% | 4.6% |
| 1 time | 8.5% | 6.2% | 8.1% | 6.5% | 9.8% | 57.7% | 5.5% | 27.0% | 4.2% | 5.7% |
| 2 or 3 times | 16.1% | 15.7% | 15.9% | 11.2% | 13.6% | 57.3% | 7.2% | 27.6% | 3.8% | 4.1% |
| 4 or 5 times | 14.3% | 17.1% | 15.3% | 15.8% | 15.3% | 53.3% | 8.3% | 27.9% | 5.6% | 4.9% |
| 6 to 9 times | 14.7% | 14.3% | 13.4% | 16.5% | 13.1% | 57.0% | 7.2% | 25.4% | 6.1% | 4.4% |
| 10 to 19 times | 17.5% | 16.0% | 16.9% | 11.9% | 15.7% | 57.7% | 6.9% | 27.3% | 3.7% | 4.5% |
| 20 plus | 26.5% | 26.7% | 24.5% | 34.6% | 29.2% | 55.5% | 7.3% | 25.1% | 6.9% | 5.3% |

| | | | | | ſ | | | | | |
|-----------------------------|---------------------------------|------------------------------|----------------------------------|-------------------|-----------------|---------------------------------|------------------------------|----------------------------------|-------------------|-----------------|
| CROSSTABS: EDUCAT | N | | | | | CROS | STABS: | EDUCAT | NOL | |
| Column Distributions | | | | | | Row D | istributio | SUC | | |
| Site Preference $p < .001$ | Less than High School Degree | High School degree or GED | Some post High Some post High | Bachelor's Degree | Graduate Degree | Less than High School Degree | High School degree or GED | Some post High Some post High | Bachelor's Degree | Graduate Degree |
| 0 times | 5.1% | 4.3% | 2.9% | 2.7% | 3.3% | 8.3% | 33.1% | 32.0% | 15.4% | 11.2% |
| l time | 6.9% | 6.6% | 6.9% | 10.7% | 12.2% | 4.7% | 21.0% | 31.4% | 25.3% | 17.6% |
| 2 or 3 times | 12.4% | 14.3% | 14.7% | 18.6% | 18.4% | 4.4% | 24.0% | 35.1% | 22.8% | 13.8% |
| 4 or 5 times | 16.0% | 13.3% | 15.6% | 14.5% | 16.0% | 6.0% | 23.5% | 39.1% | 18.8% | 12.7% |
| 6 to 9 times | 13.1% | 13.8% | 14.8% | 15.6% | 13.2% | 5.0% | 25.1% | 38.2% | 20.9% | 10.8% |
| 10 to 19 times | 14.9% | 15.6% | 17.8% | 16.7% | 17.5% | 4.9% | 24.3% | 39.5% | 19.1% | 12.2% |
| 20 nlus | 31.6% | 32.1% | 27 3% | 21.7% | 19 4% | 6 6% | 31.5% | 38 1% | 15 3% | 8.6% |

| CROSSTABS: INCOME | | | | | | | CROSS | TABS: II | NCOME | | | |
|-----------------------------|----------------------------|-----------------------------------|-------------------|--|-----------------------------|--------------------|--------------------------|-------------------|--------------------|--------------------------------------|---------------------|-------------------|
| Column Distributions | | | | | | | Row Di | stributio | IS | | | |
| Site Preference $p < .001$ | 80- 5 4 ,999 | 666'67 - 000'5 2 \$ | 666`7L - 000`05\$ | 666'66 ⁻ 000' <i>\$L</i> \$ | 666'6†1 - 000'001 \$ | \$1\$0,000 or more | \$0- 5t [,] 666 | 666'67 - 000'52\$ | 666'7/ - 000'0\$\$ | 666'66 ⁻ 000'S /\$ | 666'671 - 000'001\$ | \$150,000 or more |
| 0 times | 4.7% | 3.5% | 3.4% | 2.7% | 2.4% | 4.1% | 21.4% | 27.9% | 24.0% | 11.0% | 7.8% | 7.8% |
| 1 time | 7.1% | 7.2% | 7.0% | 7.2% | 11.3% | 10.2% | 14.4% | 25.6% | 21.8% | 13.2% | 16.4% | 8.6% |
| 2 or 3 times | 15.0% | 12.8% | 17.3% | 15.7% | 17.5% | 20.3% | 15.1% | 22.4% | 27.0% | 14.4% | 12.6% | 8.6% |
| 4 or 5 times | 15.5% | 12.6% | 14.8% | 17.3% | 15.7% | 13.9% | 16.6% | 23.6% | 24.5% | 16.9% | 12.0% | 6.3% |
| 6 to 9 times | 13.3% | 13.9% | 14.4% | 16.7% | 14.7% | 14.2% | 14.6% | 26.5% | 24.3% | 16.6% | 11.5% | 6.5% |
| 10 to 19 times | 14.0% | 19.5% | 16.9% | 15.4% | 18.9% | 14.9% | 13.0% | 31.5% | 24.2% | 13.0% | 12.5% | 5.8% |
| 20 plus | 30.4% | 30.5% | 26.2% | 25.1% | 19.6% | 22.4% | 17.8% | 31.3% | 23.8% | 13.4% | 8.2% | 5.5% |
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| CROSSTABS: AGE | | | | | | C | ROSSTA | BS: AGE | | | | <u> </u> |
| Column Distributions | | | | | | Ř | w Distri | butions | | | | |
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| CROSSTABS: AGE | | | | | | | CROS | STABS: | AGE | | | |
|---------------------------------|-------------|----------|----------------------|----------|----------------------|---------|--------------|-------------|----------|------------------|----------------------|---------|
| Column Distributions | | | | | | | Row D | histributic | SUC | | | |
| Site Preference <i>p</i> < .001 | 22 ngat 223 | 72 to 34 | 32 to 1 4 | 42 o1 24 | 7 9 01 55 | snjd 59 | 22 ngđi sejj | 45 ot 22 | 44 of 25 | 45 01 2 4 | 7 9 01 55 | sniq 23 |
| 0 times | 2.5% | 1.8% | 1.5% | 2.5% | 4.1% | 8.2% | 4.9% | 6.0% | 6.5% | 16.8% | 24.9% | 41.1% |
| 1 time | 7.3% | 6.8% | 7.6% | 7.8% | 9.9% | 8.3% | 6.3% | 10.4% | 15.0% | 23.0% | 26.8% | 18.6% |
| 2 or 3 times | 16.3% | 13.2% | 15.4% | 15.4% | 15.3% | 18.0% | 7.3% | 10.4% | 15.9% | 23.7% | 21.6% | 21.1% |
| 4 or 5 times | 14.4% | 13.7% | 15.0% | 15.9% | 13.3% | 16.0% | 6.8% | 11.4% | 16.3% | 25.8% | 19.9% | 19.8% |
| 6 to 9 times | 13.5% | 15.4% | 15.9% | 14.9% | 13.6% | 13.0% | 6.8% | 13.3% | 17.8% | 24.9% | 20.9% | 16.6% |
| 10 to 19 times | 16.3% | 17.0% | 17.0% | 16.9% | 17.6% | 15.1% | 6.8% | 12.6% | 16.4% | 24.3% | 23.3% | 16.6% |
| 20 plus | 29.6% | 32.2% | 27.6% | 26.6% | 26.4% | 21.5% | 7.7% | 15.0% | 16.7% | 23.9% | 21.9% | 14.8% |

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