An Analysis of Missouri Catfish Angler Demographics and Opinions for Fisheries Management Alternatives

Ronald A. Reitz, *Missouri Department of Conservation, 1110 South College Avenue, Columbia, MO 65201*

Vincent H. Travnichek, *Missouri Department of Conservation, 701 James McCarthy Drive, St. Joseph, MO 64507*

Abstract: Catfishes are among the most frequently sought freshwater fishes in the United States. Yet despite the popularity of catfish angling, few angler surveys have been conducted to describe the demographics, social characteristics, and opinions of catfish anglers to assist in improving fisheries management in Missouri. Thus, the Missouri Department of Conservation conducted a statewide survey of licensed anglers in Missouri in 2002. The survey asked questions specifically related to angler demographics, species preferences, angling behavior, and angler opinions on catfish management. Our results indicate that catfish anglers in Missouri are a diverse group and their preferences often differ by demography. In general, Missouri's catfish anglers are primarily male (79%), between the ages of 36 and 55 years old (52%), and live mostly (73%) in rural communities or small towns. Seventy-five percent of catfish anglers indicated that channel catfish was their favorite species to harvest. Over 80% of the anglers surveyed preferred to fish by rod and reel, and large lakes were preferred over other water body types by Missouri catfish anglers. The majority of catfish anglers preferred to catch and keep more catfish of a smaller size compared to fewer catfish of a larger size. Catfish angler opinions regarding use of gear restrictions, creel limits, or minimum length limits to increase chances of catching trophy-sized catfish varied by angler demography, and more support was seen in younger anglers with an urban background. Identifying and recognizing these differences among catfish anglers will assist managers in understanding the diversity among catfish anglers, and will assist them in making more informed management decisions that better serve this diverse angling group.

Key words: angler survey, catfish, fisheries management, human dimensions

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 58:66–81

Catfishes are among the most frequently sought freshwater fishes in the United States. A national survey of anglers revealed that 26% of those surveyed fished for catfish. This extrapolates to 7.4 million catfish anglers in the United States, and these anglers spent 91 million days fishing for catfish annually (USDI and USDC 1997). Catfish generally rank third in popularity with Missouri anglers, behind black bass and crappie, and comprise 16% of total directed angler effort (Weithman 1991). Despite the popularity of catfish angling in Missouri, no angler surveys have been conducted to describe the demographics, social characteristics, and opinions of catfish

anglers within the state. Only a few states have conducted such surveys including Kansas (Gill 1980, Burlingame and Guy 1999), Mississippi (Schramm et al. 1999), and Texas (Wilde and Riechers 1994, Wilde and Ditton 1999).

Surveys targeting specific user groups can assist in defining demographics and attitudes of these groups. Human dimensions research has cautioned against lumping all types of anglers into a homogenous group to describe the "average" angler (Graefe 1981, Chipman and Helfrich 1988, Falk et al. 1989). Such profiles are of limited use because they are difficult to apply to specific fisheries or user groups and, as Shafer (1969) indicated, there is no such thing as an "average" recreationist. There is growing recognition that outdoor recreation participants display a wide variation in their experiences, avidity, expertise, commitment, economic expenditures, and social interactions within a given activity. These factors are related to the expectations and preferences of the recreationists (Ditton et al. 1992, Salz et al. 2001). This variation and specialization has been shown in anglers (Hahn 1991, Allen and Miranda 1996, Ditton 1996).

While catfish provide important fisheries across a wide geographical area, most resource agencies recently surveyed indicated that they do not intensively manage catfish populations (Michaletz and Dillard 1999). Natural resource agencies and biologists have been reluctant to expend many resources on managing catfish because of the inability to efficiently sample and evaluate catfish populations, and because catfish anglers either have been satisfied with their fishing experiences or are less vocal than other types of anglers. However, recognizing that catfish are extremely important to the Missouri fishing experience, the Missouri Department of Conservation (MDC) formed a "Quality Catfish Committee" in 2001. This group was charged with developing strategies for conserving, creating, or enhancing high quality catfish fisheries in a variety of water-body types across the state (Dames et al. 2004).

Prior to developing a statewide catfish management plan, basic information was needed on Missouri's catfish anglers. Therefore, in 2002 a statewide survey of licensed anglers in Missouri was conducted. The survey identified catfish anglers and asked specific questions related to angler demographics, species preferences, angling behavior, and angler opinions on catfish management. Identifying differences in anglers will assist managers in understanding the diversity among catfish anglers, thus assisting them in providing a variety of fishing opportunities to meet the different desires of catfish anglers. Additionally, understanding diversity and motives of Missouri catfish anglers will allow policy makers to make better informed decisions on how best to allocate catfish resources, from both a recreational and commercial standpoint, so that most anglers are satisfied with angling opportunities and are supportive of agency goals.

Methods

MDC conducted a mail survey of licensed anglers in 2002 to gain demographic information on catfish anglers in the state and get their opinions regarding catfish and catfish regulations. A randomly selected sample of 15,000 anglers that purchased a

2001 resident fishing license, or a combination hunting-fishing license, were surveyed. All duplicate information, individuals with missing addresses, and non-Missouri residents were deleted from the data set before the final sample was drawn.

The survey was administered following recommendations by Dillman (2000) with regard to sampling, survey design, and mailing schedule. A 28-item questionnaire was developed with input from MDC biologists that included the following four sections: (1) opinions and general fishing activities in Missouri during 2001, (2) 2001 catfish angling activities in Missouri, (3) opinions and activities related to catfish angling in Missouri, and (4) background (demographic) information. Anglers were asked to respond based on their fishing activity, not that of family members or angling party. The survey was pre-addressed with business reply information to minimize mailing effort for respondents returning the survey.

The initial mailing of 15,000 surveys took place in January 2002. A follow-up survey was mailed to 11,735 non-respondents in February 2002, and a final mailing to 9,927 non-respondents was completed in March 2002. Respondents who stated they fished for catfish in Missouri during 2001 were included in the analysis. We selected nine items from the questionnaire that involved angler behaviors, opinions, and management preferences and compared responses of catfish anglers based on their age, gender, and residency background (urban/small town/rural).

Four questionnaire items concerned angling behavior. Anglers were asked how many days they fished primarily for catfish in Missouri during 2001 (1–5, 6–10, 11–15, 16–20, 21–25, and > 25 days), where they preferred to fish for catfish (large lakes or reservoirs >200 ha, small lakes <200 ha, Mississippi River, Missouri River, private farm ponds, other rivers or streams, and "other" locations), which catfish species they fished for most in 2001 (channel catfish *Ictalurus punctatus*, flathead catfish *Pylodictis olivaris*, blue catfish *Ictalurus furcatus*, or bullhead catfish *Ameiurus* sp.), and what type of fishing gear they most often used for catfish angling (rod and reel, trotline/throwline, limbline/setline, juglines, and "other" methods). Five questionnaire items concerned angler preference for hypothetical catfish management regulations. Anglers were asked if they favored restricting the use of setlines, juglines, and trotlines on some waters to improve chances of catching trophy-sized catfish by rod and reel; if they would be willing to distinguish between channel and blue catfish if it improved fishing (currently Missouri regulations allow an angler to keep 10 channel and blue catfish in any combination daily); if they favored a regulation change that increased their chances of catching a trophy-sized catfish, but decreased the number of catfish they were allowed to keep; a similar question, but with a minimum length limit; and which scenario described the number and size of catfish they would prefer to catch and keep (one 20-pound catfish, two 10-pound catfish, four 5-pound catfish, or ten 2-pound catfish).

The null hypotheses that there would be no difference in behaviors, opinions, and preferences among demographic groups were tested using techniques for categorical data analysis. Chi-square (χ^2) tests were done using log-linear models to provide standardized Pearson residuals (r_{pi}) by cell to determine whether or not significant differences in responses existed among demographic groups (Agresti 2002)

using the PROC GENMOD procedure in SAS (SAS 2000). An alpha level of 0.01 was established *a priori* for all tests in an attempt to reduce the probability of a Type I error due to the large sample size.

In the few cases where a table had fewer than five observations in 20% or more of its cells, an exact chi square option was used in conjunction with a Monte Carlo estimation of exact-p values, instead of direct-p value computations. The number of permutations for Monte Carlo estimation was 10,000. When significant differences were observed, a cell-by-cell analysis using cell chi-square and Pearson's standardized residuals (r_{pi}) was conducted to identify the nature of dependence. Cells containing residuals with absolute values of 2 or greater indicated a lack of fit with the null hypothesis in that cell (Agresti 2002). Odds ratios (OR) were used to quantify the magnitude of the differences between groups.

Results

We mailed 15,000 surveys, and 2,372 were undeliverable because of erroneous address information. Usable responses totaled 5,557, for a 44% rate of return of the 12,628 questionnaires that were delivered. About 93% of respondents stated they fished in Missouri in 2001 and, of these, 64% reported that they fished for catfish in the same year. Demographic characteristics of catfish anglers differed significantly from those respondents that said they did not fish for catfish (herein referred to as 'other anglers'). Gender distribution of anglers differed significantly between the two groups, with proportionally more males in the catfish angler group ($\chi^2 = 17.1$, df = 1, $P < 0.0001$). Age distribution of catfish anglers also differed significantly from other anglers, with proportionally more catfish anglers being < 35 years old ($\chi^2 = 17.1$, df = 5, $P = 0.004$). Rural residents constituted a significantly higher proportion of catfish anglers than other anglers ($\chi^2 = 110.3$, df = 2, $P < 0.0001$). However, Missouri's catfish anglers are primarily males (79%), between the ages of 36 and 55 years old (52%), and live mostly (73%) in rural communities or small towns (Table 1).

Channel catfish was the most sought species by catfish anglers, with 75% of them citing it as their favorite. Flathead catfish was the next most popular species at 14%. Blue catfish accounted for 9% of catfish anglers, and bullhead catfish was the favorite for only 2% of catfish anglers. Demographic characteristics were not significantly associated with species preference.

Catfish anglers were asked how many days they fished mainly for catfish in 2001. Age ($\chi^2 = 11.4$, df = 25, $P = 0.9905$) and background ($\chi^2 = 8.5$, df = 10, $P = 0.5753$) had no influence on how many days an angler fished for catfish (Fig. 1). However, gender was significantly associated with days fished ($\chi^2 = 15.1$, df = 5, $P = 0.0099$; Fig. 1). Females were 1.5 times as likely as males to fish only 1 to 5 days opposed to more than 25 days (OR = 1.5). Examination of standardized cell residuals also indicated that the proportion of males fishing >25 days annually was higher than females. Conversely, proportionally more females fished only 1 to 5 days.

Anglers were asked what type of fishing gear they most often used for catfishing

Table 1. Demographic characteristics (percent) of catfish anglers and those that did not fish for catfish in Missouri during 2001 (N = 5104).

	Angler type	
Demographics	Catfish angler (N ~ 3200)	Other angler (N ~ 1800)
Gender		
Male	78.9	73.8
Female	21.1	26.2
Background		
Rural	38.9	26.0
Small town	34.1	34.6
Urban	27.0	39.4
Age		
<25	11.0	9.6
26–35	17.5	14.5
36–45	27.2	26.2
46–55	24.4	26.8
56–65	18.1	21.1
>65	1.7	1.9

in Missouri. Rod and reel was clearly the most preferred gear of each demographic group (Fig. 2). Gear selection was influenced by gender (χ^2 = 19.1, df = 4, P = 0.0008) and background (χ^2 = 32.9, df = 8, $P < 0.0001$), but age was not significantly associated with gear selection (exact test χ^2 = 11.9, df = 20, P = 0.9110). Both males and females expressed a strong preference toward rod and reel fishing, but all other methods were used more often by males. Females were twice as likely (OR = 2.1) as males to prefer a rod and reel to a trot line. Similarly, rod and reel was the preferred angling method for those with urban, small town, and rural backgrounds. Proportionally more respondents with rural backgrounds preferred using trot/limb lines, limb/set lines, and juglines. These methods were less popular among those growing up in small towns and even less popular among those with an urban background. Those with an urban background were twice as likely (OR = 2.1) as rural residents to prefer a rod and reel to a trot line.

Gender (χ^2 = 21.7, df = 6, $P < 0.0014$), background (χ^2 = 100.0, df = 12, $P <$ 0.0001), and age (χ^2 = 76.1, df = 30, $P < 0.0001$) were all significantly associated with the water type catfish anglers preferred to fish (Fig. 3). Large lakes were the preferred catfish angling location in all groups, with the exception of those >25 years of age, who most often cited farm ponds as their favorite catfishing spot. Standardized cell residual values for gender showed that females preferred fishing lakes, both large and small (Fig. 3). Females were 1.1 times as likely as males to prefer lakes (OR = 1.1). The most noticeable differences were between urban and rural catfish anglers. More respondents with urban backgrounds selected large and small lakes as their primary destinations than expected, while rural residents selected these areas less often. Rural and urban residents had different preferences when it came to fishing in farm

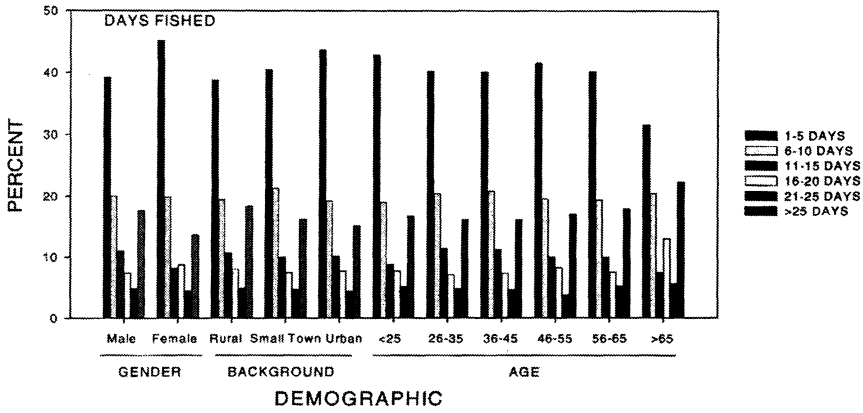

Figure 1. Annual number of days fished for Missouri catfish anglers by demographic group (gender, background, and age).

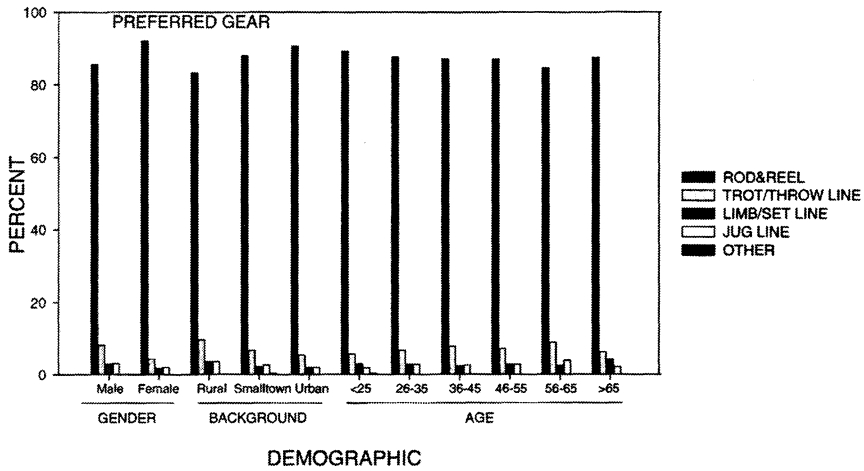

Figure 2. Preferred gear type for Missouri catfish anglers by demographic group (gender, background, and age).

ponds and other rivers and streams. Rural background respondents selected these areas more often than the model predicted, while the opposite was true for respondents with an urban background. Those with an urban background were 2.7 times as likely as those with rural backgrounds to prefer fishing in lakes rather than ponds (OR = 2.7). Respondents between the ages of 56–65 selected large lakes more often, while those < 35 years old selected large lakes (Fig. 3).

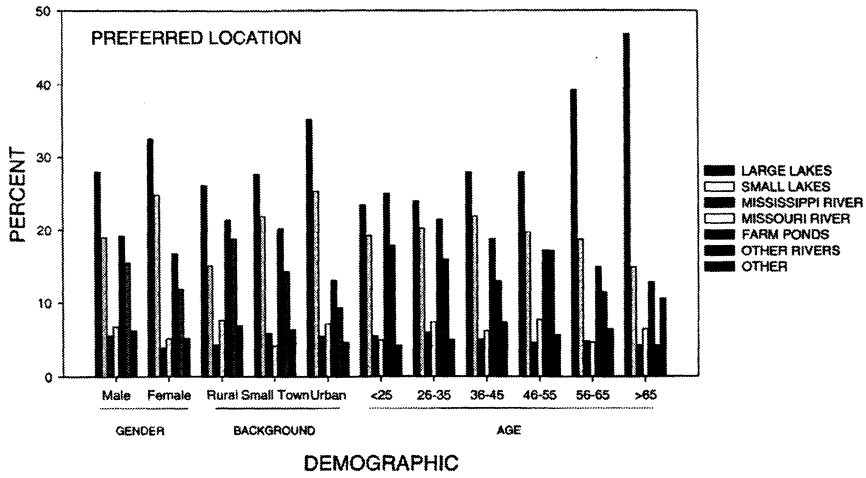

Figure 3. Fishing location preference for Missouri catfish anglers by demographic group (gender, background, and age).

Catfish angler opinions were mixed when asked if they would favor restricting the use of setlines, juglines, or trotlines on some waters to improve chances of catching trophy-sized catfish by rod and reel (Fig. 4). Analysis indicated responses were influenced by gender ($\chi^2 = 12.3$, df = 2, $P = 0.0021$), with more males than females against such a regulation. However, an outlier analysis showed that the χ^2 statistic was influenced by those that responded "don't know" to this question. When these responses were removed, no significant association was detected between gender ($\chi^2 = 5.6$, df = 1, $P < 0.0178$). Residency background also influenced responses ($\chi^2 = 105.5$, df = 4, $P < 0.0001$). Catfish anglers who had a rural background were 7.4 times as likely to oppose restricting the use of setlines, juglines, or trotlines on some waters to improve chances of catching trophy-sized catfish by rod and reel, compared those with urban backgrounds (OR = 7.4). Age was also an influence on response to this question ($\chi^2 = 30.0$, df = 10, $P = 0.0008$). Catfish anglers < 35 years of age were more supportive of the regulation, whereas anglers between the ages of 46 to 65 were less supportive of the regulation. Additionally, catfish anglers > 65 years of age were more undecided about the restriction than any of the other age groups (Fig. 4).

A majority of the catfish anglers favored a regulation in Missouri that would require anglers to distinguish blue catfish from channel catfish (Fig. 5). Responses were influenced by respondent gender ($\chi^2 = 21.0$, df = 2, $P < 0.0001$), background ($\chi^2 = 15.0$, df = 4, $P = 0.0047$), and age ($\chi^2 = 29.2$, df = 10, $P = 0.0012$). More males than females supported such a regulation (Fig. 5). However, an outlier analysis showed that the χ^2 statistic was influenced by those that responded "don't know" to this question. When these responses were removed, no significant association was detected between gender ($\chi^2 = 1.5$, df = 1, $P < 0.2234$). Catfish anglers with rural

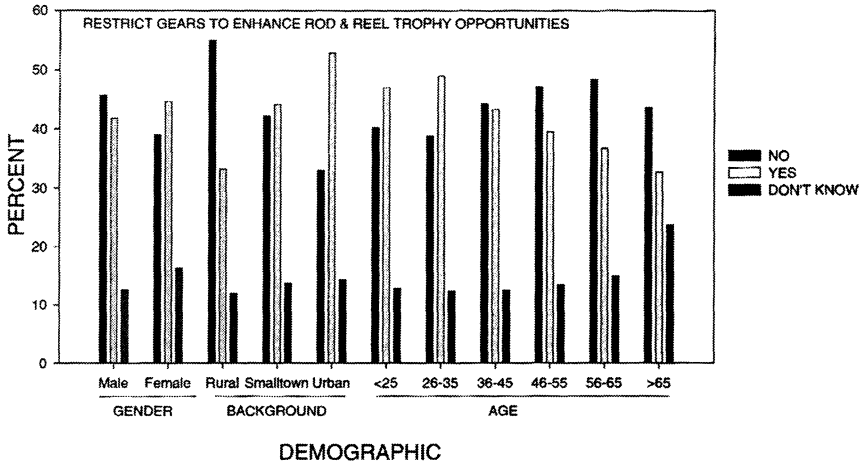

Figure 4. Missouri catfish angler opinions regarding restricting gears to enhance rod and reel trophy fishing opportunities.

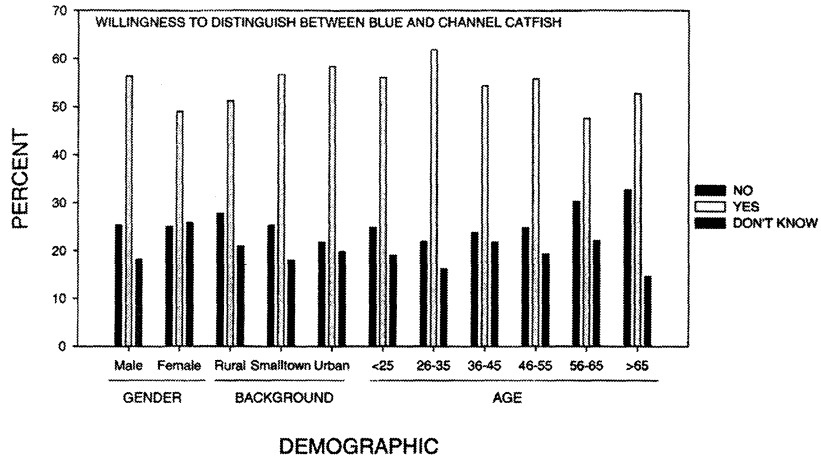

Figure 5. Missouri catfish angler opinions regarding willingness to distinguish blue catfish from channel catfish to enhance catfishing opportunities.

backgrounds were 1.5 times as likely to oppose a regulation requiring that anglers distinguish between the two species and having separate creel limits than those with an urban background. Catfish anglers ≤ 35 years were more supportive of the regulation, whereas anglers > 35 years and particularly > 56 years were less supportive of the regulation (Fig. 5).

Catfish anglers were asked if they favored a regulation change that increased

Table 2. Catfish angler attitudes (%) related to having a regulation that reduced the creel limit but increased chances of catching a trophy-sized catfish. Responses are given for each species.

	Channel catfish			Blue catfish			Flathead catfish		
	No	Yes	Don't know	No	Yes	Don't know	No	Yes	Don't know
	Gender (N = 3125)			Gender (N = 3048)			Gender (N = 3056)		
Male	58.4	29.5	12.1	51.7	34.4	13.9	51.2	34.0	14.8
Female	56.1	28.5	15.4	53.7	28.7	17.6	53.0	29.1	17.9
	Background (N = 3069)			Background (N = 2999)			Background (N = 3005)		
Rural	63.8	24.3	11.9	60.4	26.6	13.0	58.3	28.0	13.6
Small town	56.8	31.2	12.0	50.2	35.0	14.8	50.4	34.6	15.0
Urban	51.5	34.5	14.0	42.5	40.7	16.8	43.1	38.9	18.0
	Age (N = 3120)			Age (N = 3043)			Age (N = 3052)		
<25	53.3	32.9	13.8	50.7	32.7	16.6	60.3	33.9	15.8
26–35	48.5	39.0	12.5	41.2	44.2	14.6	40.8	44.6	14.6
36–45	59.0	28.2	12.8	51.9	33.2	14.9	51.0	34.4	14.6
46–55	60.6	27.6	11.8	54.2	32.2	13.6	54.2	30.2	15.6
56–65	63.9	22.1	14.0	60.0	24.2	15.7	59.1	23.3	17.6
>65	66.7	22.2	11.1	66.7	23.5	9.8	66.7	19.6	13.7

their chances of catching a trophy-sized catfish, but decreased the number they were able to keep. Over half of the respondents indicated that they would not support such a regulation for channel catfish (Table 2). Significant differences in responses by gender were not found (χ^2 = 5.2, df = 2, P = 0.0752). However, significant differences were observed by residence location (χ^2 = 34.6, df = 4, $P < 0.0001$) and age (χ^2 = 47.8, df = 10, $P < 0.0001$). Catfish anglers with rural backgrounds were 1.8 times as likely as those with urban backgrounds to oppose such a regulation (OR = 1.8). Catfish anglers who were ≤ 35 years old were more supportive of this regulation for channel catfish than were other anglers (Table 2).

Most catfish anglers did not favor this regulation change for blue catfish either (Table 2). Gender (χ^2 = 10.2, df = 2, P = 0.0061), background (χ^2 = 65.1, df = 4, $P <$ 0.0001), and age (χ^2 = 58.6, df = 10, $P < 0.0001$) influenced angler response. While a majority of both genders opposed such a regulation on blue catfish, more males favored the regulation than did females. However, an outlier analysis showed that the χ^2 statistic was influenced by those that responded "don't know" to this question. When these responses were removed, no significant association was detected between gender (χ^2 = 4.7, df = 1, $P < 0.0296$). Catfish anglers from rural areas were more than twice as likely (OR = 2.2) as those with an urban background to oppose such a regulation. Catfish anglers who were ≤ 55 years old were more supportive of this regulation for blue catfish (Table 2).

A regulation change that increased chances of catching a trophy-sized flathead catfish but decreased the creel limit was not supported by most catfish anglers (Table

Table 3. Catfish angler attitudes (percent) related to having a regulation that required releasing fish below a certain size limit but increased chances of catching a trophy-sized catfish. Responses are given for each species.

	Channel catfish			Blue catfish			Flathead catfish		
	No	Yes	Don't know	No	Yes	Don't know	No	Yes	Don't know
	Gender (N = 3126)			Gender (N = 3049)			Gender (N = 3053)		
Male	46.9	44.4	8.7	42.4	47.8	9.8	41.6	47.9	10.5
Female	43.6	45.3	11.1	53.7	28.7	17.6	41.9	44.2	13.9
	Background (N = 3068)			Background (N = 2998)			Background (N = 3000)		
Rural	51.1	39.5	9.4	48.2	41.9	9.9	47.3	42.6	10.1
Small town	45.5	47.2	7.3	42.0	48.4	9.6	41.1	48.6	10.3
Urban	40.6	48.5	10.9	34.8	52.8	12.4	34.4	51.6	14.0
	Age (N = 3122)			Age (N = 3044)			Age (N = 3048)		
<25	41.1	48.3	10.6	39.4	48.1	12.5	37.8	50.3	11.9
26–35	36.9	53.3	9.8	31.1	58.6	10.3	31.5	57.5	11.0
36–45	46.5	44.4	9.2	41.9	47.3	10.8	40.8	48.3	10.9
46–55	49.7	41.5	8.8	45.2	45.6	9.3	44.8	44.1	11.1
56–65	52.0	39.0	9.0	51.1	37.5	11.4	49.8	37.7	12.5
>65	55.6	38.9	5.6	58.3	37.5	4.2	55.3	36.2	8.5

2), similar to results observed for channel catfish and blue catfish. Significant differences in responses by gender were not found ($\chi^2 = 7.3$, df = 2, $P = 0.0255$). However, differences were observed for background ($\chi^2 = 45.9$, df = 4, $P < 0.0001$) and age ($\chi^2 = 66.9$, df = 10, $P < 0.0001$). Catfish anglers from rural areas were about twice as likely (OR = 1.9) as those with urban backgrounds to oppose such a regulation. Catfish anglers who were ≤ 45 years old were more supportive of this regulation than were those > 45 years old (Table 2).

Catfish anglers were asked if they favored a minimum size limit on catfish if the regulation increased their chances of catching a trophy-sized catfish. Responses were mixed among catfish anglers (Table 3). No significant differences existed in responses between males and females for such a regulation on channel catfish ($\chi^2 = 4.6$, df = 2, $P = 0.1006$), blue catfish ($\chi^2 = 6.3$, df = 2, $P = 0.0426$), or flathead catfish ($\chi^2 = 6.8$, df = 3, $P = 0.0332$). However, differences in responses were observed by residency background for channel catfish ($\chi^2 = 30.0$, df = 4, $P < 0.0001$), blue catfish ($\chi^2 = 37.5$, df = 4, $P < 0.0001$), and flathead catfish ($\chi^2 = 35.8$, df = 4, $P < 0.0001$). Catfish anglers from rural areas were between 1.5 and 1.7 times as likely as those with urban backgrounds to oppose a minimum length limit for all three species (OR = 1.5–1.7). Age also influenced responses to this question for channel catfish ($\chi^2 = 37.6$, df = 10, $P < 0.0001$), blue catfish ($\chi^2 = 62.6$, df = 10, $P < 0.0001$), and flathead catfish ($\chi^2 = 54.5$, df = 10, $P < 0.0001$). Younger catfish anglers (i.e., ≤ 35 years old) were more supportive of this regulation for each of the three species (Table 3).

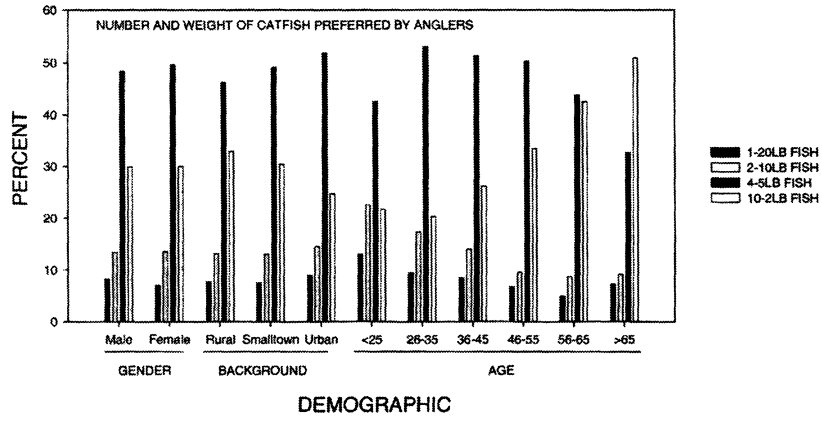

Figure 6. Missouri catfish angler opinions regarding which scenario best described the number and size of catfish they preferred to catch and keep.

Finally, catfish anglers were asked to choose which scenario (i.e., one 20-pound catfish, two 10-pound catfish, four 5-pound catfish, or ten 2-pound catfish) best described the number and size of catfish they preferred to catch and keep. Most catfish anglers preferred catching and keeping either four 5-pound catfish or ten 2-pound catfish (Fig. 6). No significant differences were observed in responses between genders ($\chi^2 = 1.3$, df = 3, $P = 0.7187$) or among backgrounds ($\chi^2 = 16.4$, df = 6, $P = 0.0119$). However, age influenced how catfish anglers responded to this question ($\chi^2 = 148.2$, df = 15, $P < 0.0001$). Catfish anglers who were $\leq$ 35 years old preferred to catch fewer but larger catfish, while anglers > 55 preferred to catch more but smaller catfish.

Discussion

Previous studies have indicated that anglers are not a homogenous group of individuals (Graefe 1980, Falk et al. 1989, Chipman and Helfrich 1988), and our results corroborate that catfish anglers in Missouri are a diverse group (Table 1). Demographics of Missouri catfish anglers were similar to catfish anglers in other states. We found that catfish anglers were predominately male (79%), similar to that observed in Texas (76%; Wilde and Riechers 1994), Kansas (78%; Burlingame and Guy 1999), and Mississippi (83%; Schramm et al. 1999). We also noted that Missouri catfish anglers were more rural than other types of anglers (Table 1), and this likely influences their preferences and opinions. We also noted that most catfish anglers are middle-aged (i.e., 51% between the ages of 36 and 55), similar to results from Kansas (Burlingame and Guy 1999) and Mississippi (Schramm et al. 1999). These results suggest that educational efforts targeted at other demographic groups

(e.g., females, younger anglers, anglers with urban backgrounds) might assist in increasing angling recruitment within Missouri.

The majority of catfish anglers in Missouri preferred to fish in lakes (~50%), followed by rivers (~30%), and ponds (~20%), and this was similar to catfish anglers in other states. The amount of time Texas catfish anglers fish in lakes, rivers, and ponds averages about 18, 14, and 7 days annually (Wilde and Riechers 1994). Mississippi catfish anglers were equally split in preference between lakes/reservoirs (42%) and rivers (42%), and the other 16% preferred to fish in ponds (Schramm et al. 1999). Burlingame and Guy (1999) noted that 60% of Kansas catfish anglers preferred to fish in reservoirs and state fishing lakes, while the remainder preferred private ponds. About 85% of Missouri catfish anglers preferred to fish with a rod and reel compared with other types of gear, and none of the other methods accounted for more than 5% of the total. Other studies on catfish angler demographics did not indicate gear preferences by anglers. Understanding Missouri catfish angler preferences on preferred angling locations could assist future MDC efforts related to acquisition and/or development of water bodies to provide more catfish angling opportunities for this group. Additionally, understanding gear preferences of catfish anglers may assist in developing future regulations that reduce user-group conflicts between traditional rod and reel anglers and anglers that use a variety of other gear types to catch catfish.

Wilde and Riechers (1994) examined Texas catfish angler support of various regulations for managing fish populations in general. They found that 52% of catfish anglers supported prohibiting the use of certain fishing gears, 66% supported creel limits, and 79% supported minimum length limits for managing fish populations. Our results indicated that only about 40% of Missouri catfish anglers supported having gear restrictions to improve chances of catching a trophy-sized catfish using a rod and reel, and results were somewhat mixed based on angler demographics (Fig. 4). Males, those with rural backgrounds, and older anglers were less supportive of such a regulation in Missouri compared with other anglers, and this is likely related to the fact that these anglers use these "other" methods more often than the other catfish anglers surveyed (Fig. 2). Using minimum size limits to improve chances of catching a trophy-sized catfish with a rod and reel was also supported by only about 40% of Missouri's catfish anglers, and results varied by angler demography (Table 3). Creel limits were even less favorable (~30% support) to Missouri catfish anglers for increasing opportunities for catching trophy-sized fish, and again, results varied by angler demography (Table 2). Jakus et al. (1996) found that older anglers preferred regulatory simplification across an area, whereas more highly educated and active anglers supported regulations that were specific for individual water bodies. Ditton et al. (1992) found that number of days anglers fished annually influenced their angling desires. They found that the importance of catching larger-sized fish related to angler satisfaction increased with number of days fished annually. Ditton et al. (1992) also found that the importance of catching and harvesting fish decreased in relation to an increase in days fished by anglers. Salz et al. (2001) found that importance of catch and harvest decreased as angling specialization increased. Accommodating diversity is a challenge facing fishery managers across North America. Gilliland (1998) stated

"Agencies, however, still design most of their management programs to provide products and services for the average angler. Management programs aimed at average users are compromises that may not fully satisfy the many segments within an agency's constituency. Approaches that may be seen as favoring special interest groups are often avoided." Peyton and Gigliotti (1989) suggested that rather than formulating generalizations about angler satisfaction and applying these to all anglers, managers should take a market segmentation approach that recognizes the fishing public is made up of many segments, and comparison of these segments often reveal differences in the relative importance they place on satisfaction elements. While a majority of Missouri catfish anglers did not support restricting gear, implementing minimum size limits, or reducing creel limits to increase opportunities to catch trophy-sized catfish using a rod and reel, about a third of Missouri catfish anglers surveyed did support such measures. Thus, these results indicated that MDC should not implement statewide, or even large-scale, regulations to increase rod and reel angling opportunities to catch trophy-sized catfish. However, results indicated that MDC is justified in implementing regulations to provide a limited amount of these opportunities at a few locations across Missouri to meet the desires of some anglers who are not harvest oriented.

Studies in Texas found that catching trophy-sized catfish was not that important of a motivational factor (Wilde and Ditton 1999), but obtaining fish for eating was an important motive (Wilde and Riechers 1994, Wilde and Ditton 1999). A majority of catfish anglers from Missouri preferred catching and keeping either four 5-pound catfish or ten 2-pound catfish rather than fewer but larger catfish. Thus, it appears that most Missouri catfish anglers have a more consumptive orientation, similar to that observed in Texas. In contrast, 37% of Mississippi catfish anglers surveyed indicated that being able to catch a large fish was very important to them when selecting a fishing site (Schramm et al. 1999).

Even though catfish anglers generally place more emphasis on catch and harvest compared with anglers fishing for other species (Wilde and Ditton 1999), many anglers are not satisfied with the emphasis placed on catfish management (Arteburn et al. 2001). Historically, fisheries managers have managed for the "average" catfish angler through maximum sustained harvest strategies (Schramm et al. 1999). This strategy has not promoted high quality catfishing opportunities and may not optimize maximum growth potential of catfish or desires of anglers who seek these large fish. Catfish anglers are most interested in catching fish to eat, but size of fish caught tends to be more important to flathead catfish and blue catfish anglers than channel catfish anglers. Trophy anglers prefer flathead catfish and blue catfish, whereas non-trophy anglers prefer channel catfish (Arterburn et al. 2002). Results of Missouri's catfish angler survey indicated that flathead and blue catfish anglers were more likely than channel catfish anglers to support restrictive regulations. Consequently, we believe that our efforts to conserve or enhance high quality catfish fisheries should focus on flathead and blue catfish, while channel catfish should be left for the primary purpose of consumption. Identifying differences among catfish anglers assisted MDC in developing our statewide catfish management plan (Dames et al. 2004), with the goals

of 1) providing a framework for developing a diversity of catfish angling opportunities in Missouri, including select water bodies that are managed for high quality catfish; 2) informing Missouri anglers of existing catfishing opportunities and MDC's efforts to enhance catfish management; and 3) engaging Missouri catfish anglers in the development and implementation of shared catfish management strategies. Results of our survey indicated that most anglers were satisfied with current management strategies towards catfish. However, about a third of catfish anglers surveyed indicated they would prefer more management emphasis on creating specialized trophy opportunities for catfish. Jakus et al. (1996) indicated that resource agencies need to manage fisheries such that they sustain aquatic resources, but they also need to respond to concerns and desires of the angling public. Thus, MDC engaged the public in six meetings across the state during autumn 2003 to discuss our draft statewide catfish management plan (Dames et al. 2004). Based on public comment, MDC revised the portions of the plan (specifically related to changes in creel and size limits for flathead catfish in a special trophy zone on the Missouri River) prior to approval.

Studies on angler motivations suggest fishing experiences involve many dimensions besides catching fish (see Fedler and Ditton 1994), and by ignoring angler motivations, resource managers may not be providing an appropriate balance of angling opportunities to fully meet public needs. While some recreational fisheries managers are becoming more aware of the need to implement programs that accommodate the diversity of satisfactions and benefits desired by the public (Chipman and Helfrich 1988), fishery managers may continue treating catfish anglers as an aggregate in their management efforts. However, by doing so, they are likely to manage for fishing outcomes that please a minority of anglers. Resource management agencies need to recognize that anglers have varying levels of specialization, and that this stands in contrast to the aggregate measures of central tendency that have guided catfish management in the past. Not recognizing that catfish anglers are diverse in their motives and desires will continue the "one shoe fits all" approach that has driven past catfish management, which is a disservice to many of these anglers.

Literature Cited

Agresti, A. 2002. Categorical data analysis, 2nd edition. John Wiley & Sons Inc., Hoboken, New Jersey.

Allen, M. S. and L. E. Miranda. 1996. A qualitative evaluation of specialization among crappie anglers. Pages 145–151 *in* L. E. Miranda and D. R. Devries, editors. Multidimensional approaches to reservoir fisheries management. American Fisheries Society, Bethesda, Maryland.

Arterburn, J. E., D. J. Kirby, and C. R. Berry, Jr. 2001. Biologist opinions and angler attitudes concerning catfish and their management in the Mississippi River basin. Mississippi Interstate Cooperative Resource Association. Final Report. Des Moines, Iowa.

_____, _____, and _____. 2002. A survey of angler attitudes and biologist opinions regarding trophy catfish and their management. Fisheries 27(5):10–21.

Burlingame, N. and C. S. Guy. 1999. Diversity among anglers in Kansas: a focus on channel

catfish anglers. Pages 427–433 *in* E. R. Irwin, W. A. Hubert, C. F. Rabeni, H. L. Schramm Jr., and T. Coon, editors. Catfish 2000: proceedings of the international ictalurid symposium. American Fisheries Society, Bethesda, Maryland.

Chipman, B. D. and L. A. Helfrich. 1988. Recreational specialization and motivations of Virginia river anglers. North American Journal of Fisheries Management 8:390–398.

Dames, R. D., et al. 2004. Managing Missouri's catfish: a statewide catfish management plan. Missouri Department of Conservation, Jefferson City.

Dillman, D. A. 2000. Mail and internet surveys: the tailored design method, 2nd edition. John Wiley & Sons Inc., New York, New York.

Ditton, R. B. 1996. Understanding the diversity among largemouth bass anglers. Pages 135–144 *in* L. E. Miranda and D. R. Devries, editors. Multidimensional approaches to reservoir fisheries management. American Fisheries Society, Bethesda, Maryland.

_____, D. K. Loomis, and S. Choi. 1992. Recreation specialization: re-conceptualization from a social worlds perspective. Journal of Leisure Research 24:33–51.

Falk, J. M., A. R. Graefe, and R. B. Ditton. 1989. Patterns of participation and motivation among saltwater tournament anglers. Fisheries 14(4):10–17.

Fedler, A. J. and R. B. Ditton. 1994. Understanding angler motivations in fisheries management. Fisheries 19(4):6–13.

Gill, A. D. 1980. The social circle of catfishermen: a contribution to the sociology of fishing. Master's thesis. Kansas State University, Manhattan.

Gilliland, E. R. 1998. Accommodating a diverse constituency: a case for tournament anglers. Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies 52:393–401.

Graefe, A. R. 1980. The relationship between level of participation and selected aspects of specialization in recreational fishing. Doctoral dissertation. Texas A&M University, College Station.

_____. 1981. Understanding diverse fishing groups: the case of drum fishermen. Marine Recreational Fisheries 6:69–79.

Hahn, J. 1991. Angler specialization: measurement of a key sociological concept and implications for fisheries management decisions. Pages 380–389 *in* D. Guthrie, J. M. Hoenig, M. Holliday, C. M. Jones, M. J. Mills, S. A. Moberly, K. H. Pollock, and D. R. Talhelm, editors. Creel and angler surveys in fisheries management. American Fisheries Society, Bethesda, Maryland.

Jakus, P. M., J. M. Fly, and J. L. Wilson. 1996. Explaining public support for fisheries management alternatives. North American Journal of Fisheries Management 16:41–48.

Michaletz, P. H. and J. G. Dillard. 1999. A survey of catfish management in the United States and Canada. Fisheries 24(8):6–11.

Peyton, R. B. and L. M. Gigliotti. 1989. The utility of sociological research: A re-examination of the East Matagora Bay experience. Fisheries 14(4):5–8.

Salz, R. J., D. K. Loomis, and K. L. Finn. 2001. Development and validation of a specialization index and testing of specialization theory. Human Dimensions of Wildlife 6:239–258.

SAS 2000. SAS/STAT User's Guide, Release 8.01 edition. SAS Institute, Cary, North Carolina.

Shafer, E. L., Jr. 1969. The average camper who doesn't exist. U.S. Department of Agriculture Forest Service, Northeast Forest Experiment Station, Research Paper NE-142, Upper Darby, Pennsylvania.

Schramm, H. L., Jr., J. T. Forbes, D. A. Gill, and W. D. Hubbard. 1999. Fishing environment

preferences and attitudes toward overharvest: are catfish anglers unique? Pages 417–425 *in* E. R. Irwin, W. A. Hubert, C. F. Rabeni, H. L. Schramm, Jr., and T. Coon, editors. Catfish 2000: proceedings of the international ictalurid symposium. American Fisheries Society, Bethesda, Maryland.

U.S. Department of Interior (USDI), Fish and Wildlife Service, and U.S. Department of Commerce (USDC), Bureau of the Census. 1997. 1996 national survey of fishing, hunting, and wildlife-associated recreation. Washington, D.C.

Weithman, A. S. 1991. Recreational use and economic value of Missouri fisheries. Missouri Department of Conservation, Jefferson City.

Wilde, G. R. and R. B. Ditton. 1999. Differences in attitudes and fishing motives among Texas catfish anglers. Pages 395–405 in E. R. Irwin, W. A. Hubert, C. F. Rabeni, H. L. Schramm, Jr., and T. Coon, editors. Catfish 2000: proceedings of the international ictalurid symposium. American Fisheries Society, Bethesda, Maryland.

_____ and R. K. Riechers. 1994. Demographic and social characteristics and management preferences of Texas freshwater catfish anglers. Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies 46:393–401.