Examining the Relationship between Species Preference and Catfish Angler Demographics, Angling Behavior, and Management Opinions

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Abstract: In 2002, the Missouri Department of Conservation (MDC) conducted a statewide survey of licensed anglers in Missouri who fished for catfish during 2001 to gain information on angler demographics, species preferences, angling behavior, and angler opinions on catfish management. Catfish anglers were grouped by the species of catfish (flathead catfish *Pylodictis olivaris*, channel catfish *Ictalurus punctatus*, blue catfish *I. furcatus*, or bullhead catfish *Ameiurus* spp.) they preferred to fish for, and differences among preference groups related to demographics, angling behavior, and opinions on catfish management were examined. Results indicated that while catfish anglers in Missouri are a diverse group, and their preferences, opinions, and behaviors differed depending on species preference of the anglers, Missouri catfish angler groups were more similar compared to catfish angler groups in other states. Most differences in Missouri catfish anglers were between anglers who preferred to fish for flathead and blue catfish compared to those anglers who preferred to fish for channel and bullhead catfish. These differences were likely related to maximum size potential of flathead and blue catfish compared with channel and bullhead catfish. 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, human dimensions, fisheries management

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Catfish anglers are a diverse group with varying desires and backgrounds (Gill 1980, Wilde and Riechers 1994, Burlingame and Guy 1999, Schramm et al. 1999, Wilde and Ditton 1999, Reitz and Travnichek 2004), and 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 7.5 million catfish anglers in the United States, and these anglers spent 104 million days fishing for catfish annually (USDI and USDC 2001). Catfish generally rank third in popularity with Missouri anglers, behind black bass and crappie, and comprise 16% of total directed angler effort (Weithman 1991).

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 regarding angler demographics, species preferences, angling behavior, and angler opinions on catfish management. This information was summarized by Reitz and Travnichek (2004). Several typologies have been constructed that categorize anglers according to social characteristics such as frequency of participation, gear preferences, and orientation towards catching fish (Bryan 1977, Fedler and Ditton 1986, Holland and Ditton 1992). These typologies have been used to understand angler behavior and attitudes independent from the type of fishery they prefer. However, managers are often more interested in differences among anglers within a specific fishery, and one way of obtaining fishery-specific information is to group anglers according to their species preferences (Wilde and Ditton 1991).

Wilde and Riechers (1994) examined angler demographics, angling avidity, and angler opinions regarding catfish management, and they found that differences existed for each of these categories based on which catfish species anglers preferred to fish for in Texas. While Reitz and Travnichek (2004) summarized information on Missouri catfish anglers, they did not cross-tabulate information based on which catfish species Missouri anglers fished for most often. Thus, in this paper we examine differences in angler

demographics, angling behavior, and angler opinions on catfish management dependent on which species of catfish (i.e., flathead catfish *Pylodictis olivaris*, channel catfish *Ictalurus punctatus*, blue catfish *I. furcatus*, or bullhead catfish *Ameiurus* spp.) Missouri anglers fished for most in 2001. Identifying and recognizing differences among catfish anglers will assist fishery 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.

Methods

We conducted a self-administered mail-back survey of licensed anglers in 2002 to gain demographic information on catfish anglers in the state and to get their opinions regarding catfish and catfish regulations. A randomly-selected sample of 15,000 anglers who 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. Input from MDC biologists was used to develop a 28-item questionnaire 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) 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 mailing information to minimize 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. Only respondents who stated they fished for catfish in Missouri during 2001 were included in the analysis. We selected 12 items from the questionnaire that involved angler behaviors, opinions, demographics, and management preferences and compared responses of catfish anglers based on the species of catfish (flathead catfish, channel catfish, blue catfish, or bullhead catfish) they fished for most in 2001 to determine if angler's species preference was associated with angler characteristics, attitudes, and opinions.

Three 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), and what type of fishing gear they most often used for catfish angling (rod and reel, trotline/throwline, limbline/setline, juglines, and "other" methods). Six questionnaire items concerned angler preference for hypothetical catfish management regulations. Anglers were asked if they thought MDC should spend more, less, or about the same amount of effort managing catfish in Missouri; 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). Three questions concerned demographics. We asked anglers their gender, their residency background (rural, small town, or urban), and their age (25 and under, 26–35, 36–45, 46–55, 56–65, or over 65).

The null hypotheses that there would be no difference in behaviors, opinions, and among species preference groups were tested using techniques for categorical data analysis. Chi-square (X^2) tests were done using log-linear models to provide standardized Pearson residuals (r_{pi}) to determine whether or not significant differences in responses existed among groups (Agresti 2002) using the PROC GENMOD procedure in SAS (SAS 2003). 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 one case 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. Where significant differences among groups 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).

Results

Of the 15,000 surveys mailed, 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 having fished for catfish in the same year. We asked catfish anglers the species of catfish they fished for most in 2001 to identify species preference. Channel catfish was the most sought after species, with 75% of catfish anglers 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.

Overall, respondents that fished for catfish were typically males (79%), lived mostly (73%) in rural communities or small towns, and over half (52%) were between the ages of 36 and 55 years (Table 1). While there was no significant difference in gender classification among species preference categories (X^2 = 9.1, df = 3, P = 0.0286), more males tended to prefer flathead catfish and more females preferred bullhead catfish (Table 1). There was no significant difference in where anglers lived and the catfish species they preferred (X^2 = 15.1, df = 6, P = 0.0199), but flathead catfish and bullhead catfish anglers tended to live in more rural areas rather than urban areas (Table 1). A significant difference was found between angler age and species preference (X^2 = 37.1, df = 15, P < 0.0012). A higher proportion of bullhead catfish anglers were under age 25 while a lower proportion of flathead catfish anglers were over the age of 45 (Table 1).

Catfish anglers were asked how many days they fished for catfish in 2001. Although the most common response for days fished for all four groups was "1 to 5 days," species preference was significantly associated with the number of days fished (X^2 = 52.9, df = 15, P < 0.0001). Anglers that preferred bullheads fished fewer days, with the majority fishing only "1 to 5 days." Blue cat anglers were more likely than other groups to fish "more than 25 days" annually (Fig. 1).

Gear type most often used by anglers differed significantly by species preference (X^2 = 354.0, df = 12, P < 0.0001). While the majority of anglers in all groups used rod and reel most often, channel and bullhead catfish anglers were more likely to use this type of gear. As might be expected, flathead and blue catfish anglers were more likely to use alternate methods such as trotlines, limblines, and jugs. After rod and reel, trotlines/throwlines were most popular with flathead and blue catfish anglers (Fig. 2).

Species preference was significantly associated (X^2 = 266.8, df = 18, P < 0.0001) with the water type catfish anglers preferred. Large lakes were the preferred location for all groups, with the exception of bullhead anglers who most often cited small lakes and farm ponds as their favorite fishing spot (Fig. 3). These smaller water bodies were also popular with channel catfish anglers. The Missouri River was popular with flathead catfish anglers. While large lakes were preferred by most catfish anglers, they were the most popular with blue catfish anglers, with nearly half of these anglers selecting this type of water body (Fig. 3).

Catfish anglers were 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. A significant difference in response was detected among angler types (X^2 = 17.5, df = 6, P = 0.0078), but results were influenced by a large number of bullhead catfish anglers that responded "Don't Know" to this question. When this category was removed from an additional analysis, no difference (X^2 = 8.9, df = 3, P = 0.0294) was detected among angler types, and each angler group was evenly split in their opposition to or support for such a restriction. Over half of Missouri catfish anglers favored a regulation in that would require anglers to distinguish blue catfish from channel catfish if it improved fishing. Differences in response by species preference approached significance (X^2 = 15.9, df = 6, P = 0.0143), but again, an outlier analysis showed that the X^2 statistic was influenced by bullhead anglers that responded "Don't Know" to this question. When these responses were removed from the analysis, P increased to 0.2049.

Catfish anglers were asked if they favored a regulation change that increased their chances of catching a trophy-sized catfish but decreased the number of fish they were allowed to keep. This question was asked separately for each species. Over half of the respondents indicated that they would not support such a regulation for channel catfish, and a significant difference in response by anglers grouped by catfish species preference was not found (X^2 = 11.9, df = 6, P = 0.0649). Most catfish anglers did not favor

Table 1. Demographic characteristics (percent) of Missouri catfish anglers who fished during 2001 (N = 3,259).

	Angler type				
Demographic	**Flathead catfish (N = 407)**	**Channel catfish (N = 2,443)**	**Blue catfish (N = 266)**	**Bullhead catfish (N = 68)**	**All catfish (N = 3,259)**
Gender (N=2,937)					
Male	83.5	78.4	77.0	70.2	78.9
Female	16.5	21.6	23.0	29.8	21.1
Residency background (N = 2,885)					
Rural	46.1	37.6	35.2	43.1	38.9
Small town	31.4	34.7	32.4	33.8	34.1
Urban	22.5	27.7	32.4	23.1	27.0
Age (N = 2,936)					
<25	13.7	10.7	9.0	19.4	11.0
26–35	20.2	16.8	20.2	26.9	17.5
36–45	32.2	26.9	28.9	17.9	27.2
46–55	20.2	25.2	24.6	14.9	24.4
56–65	12.2	18.9	14.8	14.9	18.1
>65	1.5	1.5	2.3	3.0	1.7

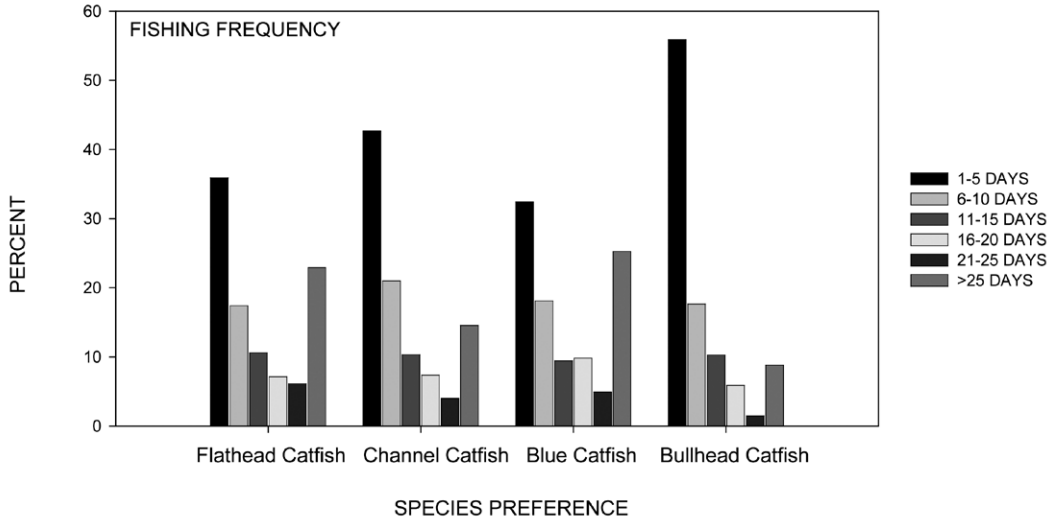

Figure 1. Annual number of days Missouri anglers fished for catfish grouped by species preference of anglers.

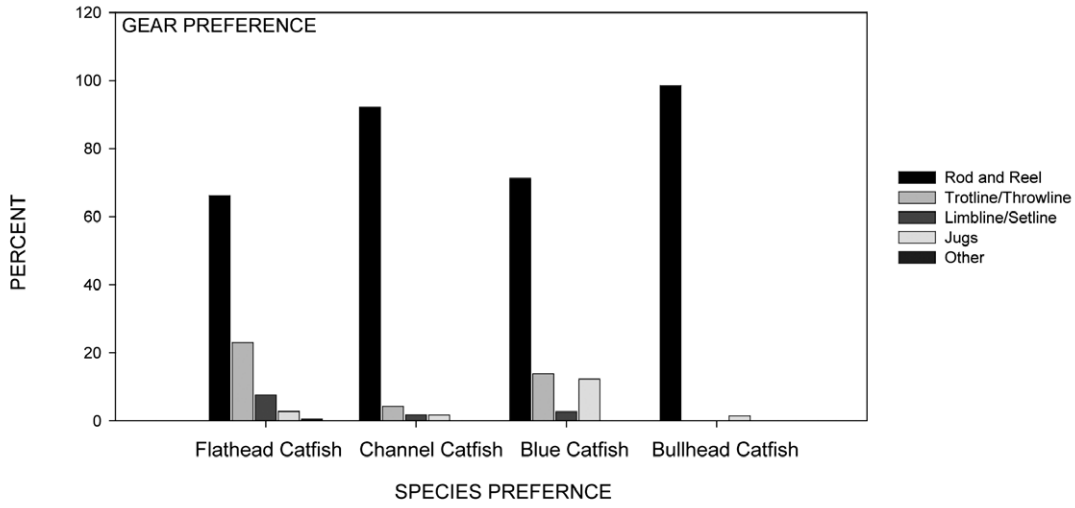

Figure 2. Preferred gear type for Missouri catfish anglers grouped by species preference of anglers.

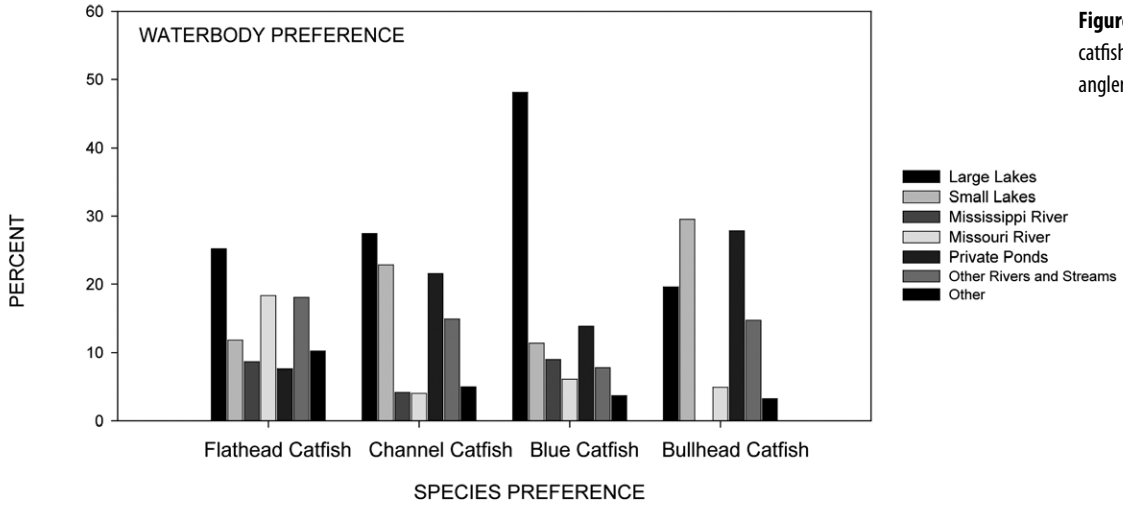

Figure 3. Fishing location preference for Missouri catfish anglers grouped by species preference of anglers.

this regulation change for blue catfish either, and responses did not vary based on species preference by anglers (X^2 = 9.8, df = 6, P = 0.1325). 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, similar to results observed for channel and blue catfish. However, a significant difference in response by species preference of anglers was found (X^2 = 25.2, df = 6, P = 0.0003). Anglers that preferred to fish for flathead catfish or blue catfish were more supportive of such a regulation than the other two angler groups, but still only 40% of both flathead and blue catfish anglers were supportive of such a regulation.

Catfish anglers were asked if they favored a minimum length limit on catfish if the regulation increased their chances of catching a trophy-sized catfish. This question was asked separately for channel, blue, and flathead catfish species. Response to this question for channel catfish did not vary among species preference groups for catfish anglers (X^2 = 13.6, df = 6, P = 0.0338). About 45% of each species preference group supported the idea, 45% opposed the idea, and 10% of each group responded "Don't Know." While responses did not differ significantly when the question was directed at blue catfish (X^2 = 14.1, df = 6, P = 0.0288), flathead and blue catfish anglers were slightly more supportive of this type of regulation (50% supported, 40% opposed, and 10% responded "Don't Know"). When asked the same question for flathead catfish, a significant difference was approached (X^2 = 16.6, df = 6, P = 0.0109). However, an outlier analysis and standardized residuals indicated the cell contributing most to the X^2 statistic was the "Don't Know" response by bullhead catfish anglers. Similar to that found with blue catfish, flathead and blue catfish anglers were slightly more supportive of this type of regulation for flathead catfish.

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. "Four 5-pound catfish" was the most common response among all the species preference groups (Fig. 4). Significant differences in response were observed among catfish species preference groups (X^2 = 189.8, df = 9, P < 0.0001). Flathead and blue catfish anglers expressed a preference toward fewer, larger fish while channel and bullhead catfish anglers preferred catching more, smaller fish. This is likely due to the growth potential of these species, since bullhead and channel catfish do not have the potential for attaining very large sizes.

Discussion

Missouri flathead, channel, blue, and bullhead catfish anglers were similar in gender, residency, and age characteristics. Slight differences in demographics were found mostly with anglers that preferred to fish for either flathead catfish or bullhead catfish. A higher proportion of males living in rural areas that were less than 45 years old preferred flathead catfish, while bullhead catfish anglers had a higher proportion of females but also lived in rural areas and were less than 25 years of age. Wilde and Riechers (1994) also found that demographics of Texas catfish anglers only varied slightly depending on species preference of the anglers.

Most Missouri catfish anglers indicated that they fished one to five days annually. However, flathead and blue catfish anglers in Missouri tended to fish more often than other catfish anglers, similar to that found in Texas (Wilde and Riechers 1994). Reitz and Travnichek (2004) found that 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 an-

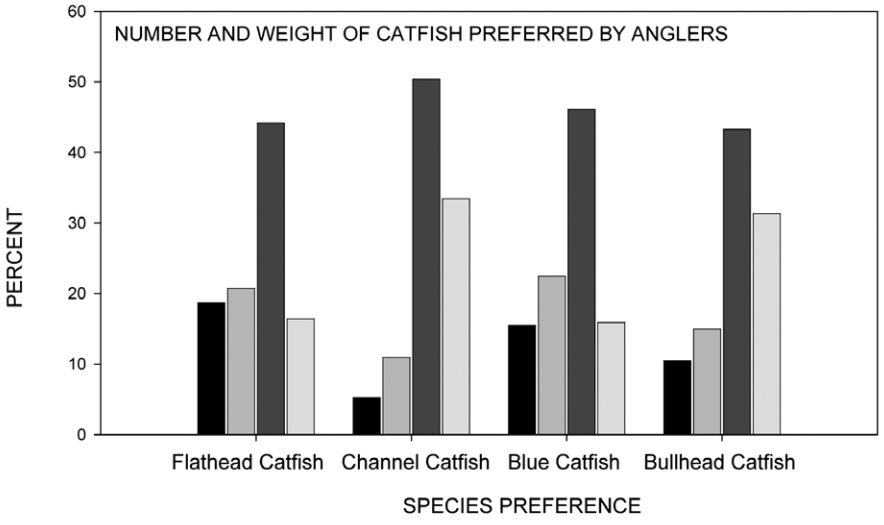

Figure 4. Missouri catfish angler opinions regarding which scenario best described the number and size of catfish they preferred to catch and keep grouped by species preference of anglers.

glers in other states (Wilde and Riechers 1994, Burlingame and Guy 1999, Schramm et al. 1999). Large lakes (≥200 ha) were the preferred fishing location by all angler groups except those that fished most for bullhead catfish who generally fished small lakes or ponds. While large lakes are important resources to most catfish anglers, particularly in Missouri, little attention has been given to catfish management in these systems (Miranda 1999). Using cluster analysis, Miranda (1999) found five groupings of reservoirs across the United States differing relative to geography, catfish harvest, angler favoritism towards catfish, and physiochemical characteristics of reservoirs. Additionally, Miranda (1999) provided management alternatives to potentially improve catfishing in each reservoir cluster, something that could be done on a more localized scale considering reservoir catfish population variation likely exists across reservoirs within almost every state of the United States.

Rod and reel angling was the preferred method for all catfish angler groups in Missouri. However, it was more common for flathead and blue catfish anglers to use trotlines, limblines, and jugs compared with the other two groups. Missouri catfish anglers were evenly split regarding their opposition or support of restricting gears to improve trophy fishing opportunities. Creel limits were opposed by more than half of Missouri catfish anglers to increase opportunities for catching trophy-sized fish. Angler support of using minimum size limits to improve chances of catching a trophy-sized catfish with a rod and reel varied depending on which catfish species the regulation was proposed for as well as species preference of anglers. Wilde and Riechers (1994) examined Texas catfish angler support of various regulations for managing fish populations in general. Texas catfish anglers were more supportive of such restrictions compared to Missouri catfish anglers. Wilde and Riechers (1994) found that 52% of Texas catfish anglers supported prohibiting the use of certain fishing gears, 66% supported creel limits, and 79% supported minimum length limits for managing fish populations.

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 four 5-pound catfish or ten 2-pound catfish rather than fewer but larger catfish (Reitz and Travnichek 2004). However, flathead and blue catfish anglers were more likely to choose fewer but larger catfish compared with either channel or bullhead catfish anglers. Wilde and Ditton (1999) also noted that flathead and blue catfish anglers were more likely to prefer catching larger fish compared to other catfish anglers in Texas. Missouri catfish anglers have a consumptive orientation which is in contrast to Mississippi catfish anglers where 37% of those surveyed indicated that being able to catch a large fish was very important to them when selecting a fishing site (Schramm et al. 1999).

Catfish anglers in Missouri 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 to channel catfish anglers. Trophy anglers prefer flathead catfish and blue catfish, whereas non-trophy anglers prefer channel catfish (Arterburn et al. 2002). Results of this 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 and bullhead catfish should be left for the primary purpose of consumption.

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 demographics, fishing preferences, and management opinions appeared to be the similar for flathead, channel, blue, and bullhead catfish anglers in Missouri, some differences were noted. These differences should be recognized by agencies responsible for managing catfish populations, and some opportunities should exist that provide a diversity of angling experiences for Missouri catfish anglers. However, MDC should not implement statewide, or even large-scale, regulations considering strong opinions many catfish anglers have regarding these issues. Results from this study indicate that MDC is justified in implementing regulations to provide some opportunities for diversifying catfish angling experiences at a few locations across Missouri to meet the desires of some anglers who are not harvest-oriented. Resource management agencies need to recognize that catfish anglers have varying desires and continuing to manage catfish populations the same statewide is a disservice to many of their angling constituents.

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