

Demographics, Attitudes, Preferences, and Satisfaction of Texas Freshwater Catfish Anglers

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Abstract: In 2010, we conducted a follow-up survey of anglers who responded to the 2009 Texas Statewide Angler Survey and indicated that they fished for catfish in the previous year or listed catfish as a preferred species. The follow-up survey assessed demographics, fishing methods, areas fished, species preferences, attitudes, and satisfaction of Texas catfish anglers. Only 26% of respondents considered catfish to be their primary species sought. We grouped anglers by their preferred species, but observed few demographic differences among these groups. Most ($\geq 70\%$) catfish anglers preferred to catch and harvest the fish they caught. Most respondents (82%) lived within or close to urban centers and preferred to fish in areas that were close to home as long as they were free of litter, noise, and other people. Most catfish anglers (62%) were satisfied with their catfishing experience; overall satisfaction was strongly correlated with the number of eating-size catfish caught ($r = 0.699$), the average size of catfish caught ($r = 0.668$), and the availability of places for them to fish for catfish ($r = 0.680$). Only 32% of respondents were very to extremely satisfied with the number of trophy catfish they caught. Based on these results, fisheries managers should focus on maintaining catch and harvest attributes for catfish but should recognize that anglers also value other fisheries. Also, managers should focus on opportunities to provide more quality catfish fisheries near urban centers.

Key words: angler survey, catfish, human dimensions, attitudes

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Many anglers in the United States fish recreationally for catfishes; in 2006, catfish were pursued by 28% of all anglers in the United States (USDI and USDC 2008). Inland waters in Texas support abundant populations of channel catfish (*Ictalurus punctatus*), blue catfish (*I. furcatus*), and flathead catfish (*Pylodictis olivaris*), and the percentage of Texas anglers that pursued catfishes in 2006 (56%) was double that of the national rate (USDI and USDC 2008). Texas anglers spent 11.6 million days pursuing catfish in 2006. Recognizing the large interest in fishing for catfish, the Texas Parks and Wildlife Department (TPWD) initiated development of a comprehensive plan to guide management and research activities for catfish in Texas' inland waters.

Two previous studies of Texas catfish anglers have examined angler demographics, fishing motivations, and catch-related attitudes. Wilde and Riechers (1994) found Texas catfish anglers to be predominantly lower-income males who fished an average of 26 to 42 days in the previous year and, with the exception of flathead catfish anglers, primarily fished on reservoirs. Anglers' responses to questions concerning consumption and preferred regulations differed depending on which species they preferred to catch. Wilde and Ditton (1999) examined catfish angler motivations and an extended list of catch-related attitudes. Compared to other angler

groups, catfish anglers were less interested in catching trophy fish and more interested in obtaining fish to eat. Both studies defined catfish anglers based on their first-choice species preference from the most recent "Texas Statewide Angler Survey." Whereas these studies were able to provide insights into the relative importance of different aspects of the angling experience to dedicated catfish anglers, neither study specifically asked anglers for information about their catfishing trips. Instead, it was assumed that responses of anglers who preferred catfish reflected angling trips for catfish and not their fishing in general. In addition, previous studies did not survey anglers who might occasionally fish for catfish, but did not indicate it to be a preferred species. Our objectives in this survey were two-fold. First, we wanted to assess current Texas freshwater catfish angler characteristics, participation patterns, species preferences, attitudes, and site preferences related specifically to catfish angling. Second, we wanted to examine angler satisfaction with catfishing and the places they go catfishing in Texas.

Methods

Questionnaire Design and Implementation

Data used in this study were drawn from five sections of the 2010 Texas Statewide Catfish Angler Survey, a comprehensive sur-

vey designed to achieve multiple objectives (Hunt and Hutt 2010). The first section covered angler demographics including age, gender, race/ethnicity, household income, place of residency, and education level. The second section targeted general angling behavior including years of general angling and catfish angling experience, frequency of catfish angling trips on different types of waters, and the typical number and size of catfish caught and harvested. Additionally, we sought opinions on what constituted “eating-sized” and “trophy-sized” catfish for the various species. The third section of the survey investigated consumptive orientation of catfish anglers. Consumptive orientation (Fedler and Ditton 1986, Wilde and Reichers 1994) consists of four attitudinal constructs (catching something, catching numbers, catching large or trophy fish, and keeping fish). Anglers indicated the extent to which they agreed or disagreed with 16 items designed to measure each of the four constructs using a standard Likert scale (Likert 1932, Anderson et al. 2007). The fourth section of the survey investigated site attributes important to catfish anglers. The importance of various site attributes was measured with a similar Likert-type scale. The final section assessed angler satisfaction with catfishing in Texas and with the places they went catfishing in Texas in the previous year using a similar Likert-type scale, scaled for satisfaction. The first set of satisfaction questions asked respondents to rate their overall level of satisfaction with catfishing in Texas and with five catch-related aspects of catfishing (i.e., number of edible- and trophy-sized catfish caught, average size caught, number allowed to harvest, and size allowed to harvest). The second set of satisfaction questions asked respondents to rate their overall level of satisfaction with the places they had gone catfishing in the previous year, and six aspects of those fishing sites (i.e., availability, number of people present, amenities, cleanliness, availability of other activities, and services). This approach assumes that an angler’s overall satisfaction with fishing is a result of their satisfaction with the individual components of the angling experience (Connelly and Brown 2000, Arlinghaus 2006, Brunke and Hunt 2007).

The “2010 Texas Statewide Catfish Angler Survey” was mailed to 1,078 individuals who had responded to the “2009 Texas Statewide Angler Survey” and had indicated that they had either fished for catfish in the previous year or listed “catfish” or a particular catfish species as one of their three most-preferred species to catch while freshwater fishing in Texas. Survey implementation used Dillman’s Tailored Design Method (Dillman 2007) to increase response rates. Details on the administration of this survey can be found in Hunt and Hutt (2010).

Data Analysis

We used SAS 9.2 (SAS Institute 2010) to run all analyses. We used logistic regression (PROC LOGISTIC) to test whether age,

gender, or place of residence (in this case coastal or non-coastal based on the TPWD definition) had a significant effect on whether an individual had responded (i.e., non-response bias, Fisher 1996) to both the “2009 Texas Statewide Angler Survey” and then to our “2010 Texas Statewide Catfish Angler Survey.” Age, gender, and place of residence were the only variables known for both respondents and non-respondents in the “2009 Texas Statewide Angler Survey” and this survey. We calculated two separate probabilities to adjust for non-response bias, one to account for the differences between respondents and non-respondents to the “2009 Texas Statewide Angler Survey” and a second for this survey. We had to adjust for both surveys since our follow-up survey was sent only to those who had responded to the “2009 Texas Statewide Angler Survey.” We computed the respondent sampling weights (i.e., the reciprocal of the product of the response probabilities) and adjusted all frequencies, sample means, proportions, and statistical analyses in this manuscript to correct for non-response bias.

We used zip code data from the survey to assign respondents to four geographic groups: one of three metropolitan statistical areas (MSA) or “Outside MSAs.” An MSA consists of a large population nucleus (50,000 or more), together with surrounding communities that have close social and economic ties (U.S. Census Bureau 2012). We labeled the Dallas-Fort Worth-Arlington MSA as “Dallas,” the Houston-Sugar Land-Baytown MSA as “Houston,” and combined the Austin and San Antonio MSAs into a group labeled “Austin-San Antonio.” We used log-linear models (PROC GENMOD) to test whether there were differences in the species preferred by catfish anglers and whether this varied across our geographic groups. We used ANOVA (PROC GLM) to test whether there were differences in age, experience, household income, days fished, eating size, and trophy size associated with species preference. We used likelihood ratio tests on cell frequencies (PROC SURVEYFREQ) to test whether attitudes, site preferences, or satisfaction differed across our species groups. We used PROC MIXED to test whether there were differences in motivation scores. When significant differences were detected in the model, we computed pairwise differences using a Sidak adjustment (Sidak 1967) to control the maximum experimentwise error rate (SAS Institute 2010) and assessed which pairwise differences were significant. We evaluated relationships between the number of fish caught and the years fished using nonlinear regression (PROC NLIN). We applied a square-root transformation to the catch data before fitting the regression to meet the assumptions of normally-distributed errors. To ascertain which aspects of the angling experience had the greatest effect on overall satisfaction we used a Pearson’s correlation analyses to measure the relative importance of each element of the fishing experience to overall satisfaction with catfishing and catfishing sites. We used an alpha level of 0.05 for all statistical tests.

Table 1. Results of the logistic regression to account for non-response bias analysis for both the statewide and the follow-up statewide survey of catfish anglers.

Parameter	df	Coefficient	SE	Wald χ^2	P-value
Statewide survey					
Intercept	1	2.640	0.135	383.33	< 0.001
Age	1	-0.043	0.003	299.16	< 0.001
Area (Coastal)	1	0.133	0.067	3.98	0.046
Sex (Female)	1	0.235	0.075	9.80	0.002
Follow-up catfish angler survey					
Intercept	1	1.623	0.305	28.25	< 0.001
Age	1	-0.040	0.006	53.74	< 0.001
Area (Coastal)	1	0.103	0.170	0.37	0.545
Sex (Female)	1	0.064	0.170	0.14	0.708

Table 2. Basic demographic characteristics of Texas' catfish anglers. Within a row, values with different superscripted letters were significantly different at alpha = 0.05.

	Blue (n = 146)	Channel (n = 211)	Flathead (n = 51)
Locale			
Dallas MSA (%) (n = 80)	59.0 ^A	31.5 ^A	9.5 ^B
Houston MSA (%) (n = 73)	52.6 ^A	42.8 ^A	4.6 ^B
Austin-San Antonio MSA (%) (n = 43)	46.7 ^A	44.5 ^A	8.8 ^B
Outside MSAs (%) (n = 212)	49.6 ^A	33.3 ^A	17.1 ^B
Mean age (years)	47.5 ^A	43.8 ^B	44.6 ^B
Mean experience (years)			
Fishing (years)	37.4 ^A	33.2 ^B	33.6 ^B
Catfishing (years)	31.6 ^A	27.6 ^A	28.2 ^A
Median income (\$ × 1,000) ^a	60–79 ^A	60–79 ^A	60–79 ^A
Mean days fishing annually	27.2 ^A	31.8 ^A	26.7 ^A
Mean days fishing in:			
Ponds	3.9 ^A	3.8 ^A	2.0 ^A
Reservoirs	13.1 ^A	16.1 ^A	13.2 ^A
Rivers	3.9 ^A	3.6 ^A	6.8 ^B
Mean replacement costs (\$)	7,701 ^A	8,458 ^A	6,260 ^A
Mean eating size (mm)	406 ^A	356 ^A	432 ^A
Mean trophy size (mm)	762 ^A	711 ^A	838 ^A

a. We report the median household income because household income was a categorical variable.

Results

Response Rate and Non-Response Bias

When adjusted for non-deliverable and non-eligible responses (i.e., refusals, address changes, deaths, or those who indicated they did not fish), the final adjusted response rate for the survey was 57.3%. Ninety-seven individuals who provided useable responses indicated that they had neither fished for nor caught a catfish in the previous two years, giving an effective sample size of 490 individuals for most of the variables used in the data analyses. All 587 respondents completed the demographic questions.

The logistic regression analysis indicated that age, gender, and place of residence were all significant predictors of non-response

to the original statewide survey, but only age significantly predicted non-response probability to the follow-up survey of catfish anglers (Table 1). The older the respondent, the more likely they were to respond to both surveys, whereas females and inland county residents had a greater likelihood of responding to the original statewide survey.

Demographics and General Angling Behavior

Most respondents to this survey were males (85%) of Anglo origin (91%). About 69% had attended at least some college, 37% had graduated college, and 10% had post-baccalaureate degrees. Respondents were geographical dispersed throughout the state, but consistent with the majority of Texans, most respondents (82%) lived within 50 miles of major population centers of Dallas (41%), Houston (37%), and Austin-San Antonio (22%). When we tested whether the species preferred was a function of the angler's place of residence, we found the three metro areas differed significantly from the "Outside MSAs" group ($P < 0.02$). Although respondents in all areas preferred blue and channel catfish compared to flatheads, those from the "Outside MSAs" had a much higher preference for flatheads than did the respondents from the metro areas. Many of the basic demographics were similar regardless of species preference (Table 2). Only 2% of respondents ($n = 9$) preferred to fish for "other catfish" and their data are not included in Table 2.

Regardless of their preferred species, anglers fished most often in reservoirs; however, anglers who preferred to fish for flathead catfish fished in rivers more often than those who preferred to fish for channel or blue catfish (Table 2). Respondents reported that about one-third of their catfishing trips included fishing during nighttime hours, regardless of species preferred. Respondents indicated that on a typical catfishing trip they caught an average of 9.1 catfish and on average harvested two-thirds of the fish they caught. Although there was a lot of variability in the relationship (pseudo- $R^2 = 0.10$, hence low predictive power), the number of catfish caught was significantly related to the number of years they had fished for catfish ($P < 0.001$; Figure 1). The catch rate increased during the first 10 years of experience, then leveled off. Only 6.6% of respondents indicated they typically caught one or fewer catfish per day.

When asked to rate the importance of fishing compared to their other outdoor activities, about 45% of respondents indicated that fishing was their most important outdoor activity. When asked to rate the importance of catfishing to their fishing for other species only 26% indicated it was their most important type of fishing; 33% and 15% indicated it was their second and third most important type of fishing, respectively.

Table 3. Results (percentages rounded to whole numbers and adjusted for non-response) of attitudes associated with catfishing. Attitudinal constructs are catch something (CS), catch numbers (CN), catch large/trophy (CL) and keep fish (KF). To compare constructs, we scored responses (1 = strongly disagree to 5 = strongly agree); entries with asterisks have the scoring scale reversed when scored to give consistent responses across the construct.

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Construct
When I go fishing, I'm just as happy if I don't catch a fish	6	26	27	32	9	CS*
A fishing trip can be successful even if no fish are caught	4	9	9	50	29	CS*
If I thought I wouldn't catch any fish, I wouldn't go fishing	18	39	14	20	9	CS
When I go fishing, I'm not satisfied unless I catch something	14	41	21	18	7	CS
The more fish I catch, the happier I am	2	13	15	38	32	CN
A successful fishing trip is one in which many fish are caught	3	27	23	32	14	CN
A full stringer is the best indicator of a good fishing trip	8	42	22	21	8	CN
I'm happiest with a fishing trip if I at least catch the daily bag limit of fish	8	40	24	19	9	CN
I would rather catch one or two big fish than ten smaller fish	4	33	29	25	9	CL
The bigger the fish I catch, the better the fishing trip	6	27	28	27	11	CL
I'm happiest with a fishing trip if I catch a challenging game fish	2	12	24	45	17	CL
I like to fish where I know I have a chance to catch a "trophy fish"	3	26	28	33	10	CL
I want to keep all the fish I catch	26	52	10	9	2	KF
I'm just as happy if I don't keep the fish I catch	4	16	17	48	15	KF*
I'm just as happy if I release the fish I catch	4	15	20	43	18	KF*
I usually eat the fish I catch	3	14	12	32	40	KF

Attitudes and Site Attributes

We found no evidence of species-specific differences in any of the attitudes. Catching and keeping catfish was important among respondents (Table 3), regardless of preferred species. Overall, respondents were fairly evenly split across all four attitudinal constructs. The average scores for catching large or trophy fish (13.0) and catching numbers (12.7) were not significantly different ($P=0.53$), but were slightly, and significantly, higher than the scores for keeping fish (11.0; $P<0.002$) and catching something (10.2; $P<0.001$). Most respondents were happier when they caught fish (70%). Respondents usually ate the catfish they caught (72%). However, most respondents also suggested that catching and keeping fish were not the only measures of a successful trip ($\geq 61\%$). Only 37% of our respondents agreed with the statement "I would rather catch one or two big fish than 10 smaller fish." We allowed each respondent to define "big" and "small" for themselves. We did not specifically ask for the respondent's definition of "big" and "small", but each respondent did give us their idea of "eating-sized" and "trophy-sized" fish (Table 2).

We found no evidence of species-specific differences in how anglers rated fishing sites. Respondents had definite ideas concerning which places they preferred to fish (Table 4). Most respondents preferred to fish close to where they lived ($\geq 70\%$), in areas that gave a sense of privacy or solitude ($\geq 67\%$), but that had some amenities ($\geq 53\%$) and were clean (91%).

Satisfaction

We found no evidence of species-specific differences in our measures of either satisfaction with fishing or in the places fished.

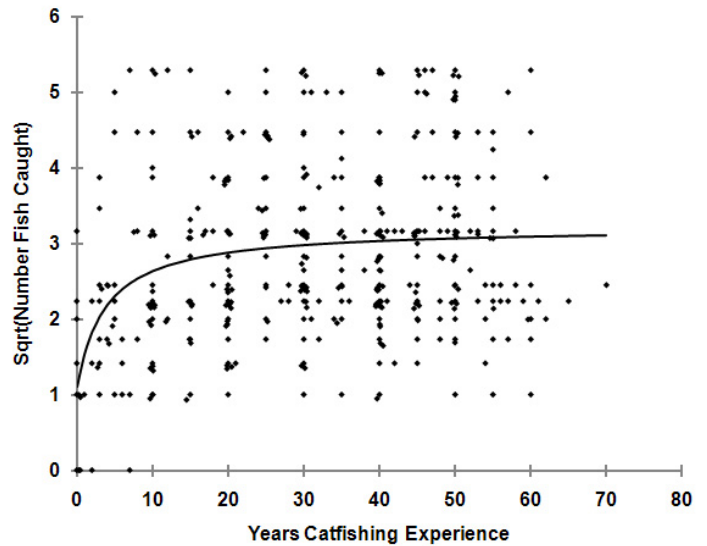


Figure 1. Relationship between the number of years fished for catfish (X) and the square-root of the number of catfish routinely caught (Y; $Y = 1.12 + [(2.10 \times X) / (3.79 + X)]$; $r\text{-squared} = 0.10$). Before plotting, a small amount of variability was added to each point to reduce the overlap of any duplicates.

Sixty-two percent of respondents indicated that they were either very or extremely satisfied with catfishing in Texas (Table 5). Most respondents were also very to extremely satisfied with the number of catfish they were allowed to harvest (68%), the size of catfish they were allowed to harvest (66%), and with the number of eating-size catfish they caught (56%). However, only 33% of respondents were very to extremely satisfied with the number of trophy catfish they caught. Based on the correlation analysis, overall satisfaction with catfishing in Texas was significantly correlated with satisfaction

Table 4. Results (percentages rounded to whole numbers and adjusted for non-response) of individual site preferences associated with catfishing in Texas. To compare site preferences, we scored responses (1 = strongly disagree to 5 = strongly agree)

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Fishing where I can expect to catch a limit of catfish	2	20	33	35	9
Fishing where there are other recreational opportunities available for the family to enjoy	3	9	26	47	14
Fishing where you cannot hear or see busy traffic	1	5	25	43	26
Fishing waters that have been stocked recently	3	20	51	20	7
Fishing where you don't have to see too many other people	1	6	26	49	18
Fishing where you can rent or buy fishing equipment	10	27	45	15	3
Fishing where boat launches are available	4	10	22	40	23
Fishing where restrooms are available	4	12	31	40	13
Fishing where you feel far away from other people and cities	0	9	29	42	20
Fishing where piers or jetties are available	2	14	40	38	7
Fishing where picnic tables are available	4	21	44	27	5
Fishing where you do not have to walk for more than 15 minutes	4	14	37	32	13
Fishing where fishing guides are available for hire	13	29	47	8	2
Fishing waters that are close to home	1	5	24	51	19
Fishing where boat rentals are available	9	31	48	9	2
Fishing an area that is free of litter	1	1	6	29	62

Table 5. Results (percentages rounded to whole numbers and adjusted for non-response) of individual satisfaction items and their correlation with overall satisfaction with catfishing in Texas, and with catfishing sites in Texas. All correlations were significant. Mean rating (SE) based on: 1 = not at all satisfied; 2 = slightly satisfied; 3 = moderately satisfied; 4 = very satisfied; 5 = extremely satisfied.

Statement	Not satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Extremely satisfied	Mean rating	Pearson's r
Satisfaction with catfishing	2	4	32	50	12	3.66 (0.04)	1.000
The number of eating size catfish I catch	3	10	30	47	9	3.49 (0.05)	0.699
The number of trophy size catfish I catch	11	18	38	28	5	2.96 (0.05)	0.507
The average size of the catfish I caught	2	10	38	43	6	3.41 (0.04)	0.668
The number of catfish I am allowed to harvest	1	5	26	54	14	3.74 (0.04)	0.420
The size of catfish I am allowed to harvest	1	5	27	52	14	3.73 (0.04)	0.483
Satisfaction with places I go catfishing	2	4	32	47	14	3.69 (0.04)	1.000
The availability of catfish fishing spots in your area	3	10	29	44	13	3.54 (0.05)	0.680
The number of people in the areas you fished	2	12	47	32	6	3.28 (0.04)	0.495
The amenities (i.e., docks, restrooms, picnic tables, etc.) in the areas you fished	3	12	43	36	7	3.32 (0.04)	0.375
The cleanliness of the areas you fished	3	15	37	38	8	3.33 (0.05)	0.474
The availability of other activities	3	10	43	38	6	3.35 (0.04)	0.395
The services (i.e., guides, boat rentals, etc.) in the areas you fished	5	17	44	29	5	3.12 (0.05)	0.364

with all five individual components of the catfishing experience that were measured in the survey (Table 5). Overall satisfaction with catfishing was strongly correlated ($r > 0.60$) with angler satisfaction concerning the number of eating-sized catfish caught and the average size of catfish caught. This result indicates these items had the strongest influence on overall satisfaction. Overall satisfaction was moderately correlated ($0.30 \geq r \geq 0.60$) with the size and number of catfish respondents were allowed to harvest, and the number of trophy size catfish caught. Overall satisfaction with catfishing was also strongly correlated ($r = 0.73$) with the overall site satisfaction.

Sixty-one percent of respondents indicated they were either very or extremely satisfied with the places they go catfishing in Texas (Table 5). Most respondents were also very to extremely satisfied with the availability of catfishing sites (57%). Fewer than 50%

of respondents were very to extremely satisfied with all other site attributes. The three attributes they were least satisfied with (not at all or slightly satisfied) were the services provided (22%), the cleanliness (18%), and the amenities (15%). Overall satisfaction with catfishing sites was strongly correlated ($\rho > 0.60$) with the availability of catfishing locations in the area. Overall satisfaction with catfishing sites was moderately correlated ($0.30 \geq \rho \geq 0.60$) with (in descending order) the number of people at the sites, the cleanliness of the sites, the availability of other activities, the amenities, and the services provided at the site.

Discussion

We found that responses from Texas' catfish anglers were quite similar across species preference groups. For most demographic variables, we found no statistical differences when we segregated

anglers based on the species most preferred; where differences did exist, they were frequently minor. This is in contrast to past authors (Wilde and Riechers 1994, Reitz and Travnichek 2007) who have used species preference to discriminate between anglers. In Wilde and Reichers (1994), most of their respondents were from a generic “catfish” group. Hence, their findings might reflect differences amongst the most avid of catfish anglers whereas our findings may reflect a wider spectrum of anglers for each species. Differences between this study and Reitz and Travnichek (2007) may reflect true differences between Texas and Missouri anglers. Our findings did agree with Wilde and Riechers (1994) and Reitz and Travnichek (2007) in that anglers who preferred flathead catfish spent more time fishing rivers than did anglers for blue and channel catfish. Regardless, anglers of all three species fished most often in reservoirs. In contrast, in Mississippi (Schramm et al. 1999), catfish anglers preferred rivers, streams and spillways, whereas in Kansas (Burlingame and Guy 1999) most anglers preferred private ponds. Arterburn et al. (2002) found that most anglers seeking trophy catfish preferred to fish big rivers. As catfish can be found in a variety of waterbody types, one possibility is that differences in the primary area fished across the different states might reflect availability of access. Future surveys might investigate where anglers would prefer to fish if they had unfettered access to all waterbodies.

Despite being similar across a variety of demographic variables, some differences in opinions and attitudes were observed. Whereas previous studies (Fedler and Ditton 1994, Wilde and Ditton 1999) suggested there was low interest in trophy fish, our study suggested that for a portion of anglers, catching large or trophy fish is important. We found most anglers are satisfied with the catch and harvest aspects of the current fisheries, but were less satisfied with the numbers of trophies they caught. On average, respondents scored near the middle of the range for all consumptive constructs. These results suggest there is no one measure of success when it comes to creating the ultimate catfish fishery.

Similar to previous surveys (Wilde and Riechers 1994), our results suggested that catch-related aspects of the fishing experience were significantly correlated with anglers’ level of satisfaction. Whereas catch and release is popular among some catfish anglers (Wilde and Ditton 1999, Arterburn et al. 2002, Reitz and Travnichek 2007), 70% of anglers in this study harvested their fish. Most respondents suggested they were happier when they caught and kept fish. However, they also suggested they could enjoy a fishing trip even if no fish were caught or kept. One resolution to this apparent contradiction is that our respondents frequently had high catch rates. Whereas it might take several years for newer anglers to learn how to catch fish routinely, most of our anglers have been fishing more than 27 years, a point at which the average catch

was about 9 fish per trip. Because most respondents appeared to be successful anglers, a few unsuccessful trips may not affect their overall satisfaction.

Site attributes were an important aspect of angler satisfaction. Most catfish anglers preferred to fish in locations that were not crowded, gave them a feeling of solitude, provided recreational opportunities aside from fishing, and were free from litter. Mississippi anglers also liked areas that were free of litter (Schramm et al. 1999), but seemed much less concerned about crowding. Many respondents also indicated that they fish at night. In Kansas (Burlingame and Guy 1999), as many as 55% of catfish anglers fished evening and nights, whereas in Texas, 33% suggested at least part of their trip extended into the night. Texas anglers, like Kansas anglers (Burlingame and Guy 1999), preferred to fish close to home. Like most Texans, most (82%) of our respondents lived within 50 miles of an MSA. To better understand and design sites that will appeal to Texas catfish anglers, social carrying capacity and quality of the settings surrounding waterbodies need to be studied (Manning 1999).

Unfortunately, this study is not as representative of Texas catfish anglers as we would have hoped. Response rates to statewide angler surveys in Texas have fallen from around 70% in the 1980s to about 40% currently (TPWD, unpublished data) suggesting that occasional anglers likely do not respond at the level they did historically. Furthermore, non-respondent analysis from previous statewide surveys in Texas has shown that Hispanics and African-American anglers do not respond at the same level as Anglos. These response rates, then, result in respondents being an even more homogenous group than they once were and results are biased toward the more avid anglers in the population. In the future, Texas’ demographics are expected to change with an increase in the proportion and number of younger Hispanics in the population (Murdock et al. 2003), a group poorly represented in this survey. Correcting non-response bias is not a cure-all for a survey non-representative of Texas catfish anglers. The result is a loss of characteristic diversity in the sample. Future studies should investigate other mechanisms for obtaining information from catfish anglers who this study may have excluded. Despite these concerns, we believe mail surveys still are a quality, inexpensive method of reaching the angler population. Those who do respond are likely the ones who are most invested in the activity, so results should still provide useful information for managers seeking to improve catfishing and angler satisfaction.

Management Implications

This survey was undertaken to better understand the needs and desires of Texas catfish anglers. Although the majority of catfish

angling occurred in reservoirs, a substantial fishery for flathead catfish existed in some rural Texas rivers. Therefore, TPWD should focus their efforts on maintaining healthy reservoir fisheries, but should not ignore rivers, especially those with flathead fisheries. Further, although this study was targeted at catfish anglers, most catfish anglers also targeted other species. Because catfish anglers do not fish exclusively for catfish, management strategies should focus on multi-species approaches.

Whereas many catfish anglers want to keep catfish, others seem focused more on trophy opportunities. Management strategies should focus on providing a variety of experiences. Overall satisfaction was high, but a substantial portion of Texas' anglers was dissatisfied with the number of trophy fish available. Hence, increasing the opportunities for trophy fisheries should be considered. Because we found no relationship between the consumptive constructs and the preferred species sought managers have the flexibility to create separate management goals for the different catfish species. Arterburn et al. (2002) found that non-trophy anglers along the Mississippi preferred channel catfish, whereas trophy anglers preferred blue and flathead catfish. In Texas, as in Missouri (Reitz and Travnichek 2007), one approach may be to provide harvest-oriented channel catfish fisheries and use blue or flathead catfish to provide for trophy opportunities.

Most respondents lived either within or near an urban setting and preferred to fish close to home. Managers should consider working with urban planners to create urban oases: urban locations where anglers can feel as if they are separated from both the trappings of the city and others. These urban oases may include self-sustaining as well as intensively-managed fisheries. Oases should also provide recreational opportunities aside from fishing, and should emphasize site attributes such as cleanliness and amenities. Fortunately, Buker and Montarzino (1983, quoted in Carr et al. 2007) found that water is the single-most desired feature of an urban park. Because most of Texas' larger cities are located near water, it should be possible to create urban oases close to most catfish anglers. Outside urban areas, options such as limited entry (Luebke and Betsill 1999) or segregating users based on time of day could be considered. Reserving dusk to dawn for angling would provide an opportunity to segregate urban catfish anglers from other users (e.g., skiers, casual boaters). Managers should investigate the operational hours at fishing sites and determine whether they are conducive to providing opportunities to those anglers who may prefer night-fishing. Management should work to provide a diversity of fisheries in Texas' public waters, including large river-reservoir systems, small streams, and small impoundments. Such an approach would appear to meet the current and future needs and preference of Texas' catfish anglers.

Whereas managers routinely use mail surveys to collect information on catfish anglers, our survey suggested other methods should be explored. One option is to create and query focus groups that are representative of the population in that area. Another alternative is to conduct on-site surveys in conjunction with creel surveys. Surveys could be directed towards known catfishing sites on rivers and reservoirs to refute or verify the information provided by statewide mail surveys. Such an approach would allow an agency to collect data across a wider set of demographics. Once data has been collected, Balsman and Shoup (2008) suggest managers couple ESRI's Tapestry Segmentation measures with geographic information systems to better understand their anglers on a suite of ethnic and economic demographics, as well as learn where anglers are located geographically within the state and particular cities. These approaches could improve both management and marketing strategies.

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