

# Identifying Factors that Influence Angler Perceptions of Fishery Quality on State-owned Fishing Impoundments

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*Abstract:* Literature on recreational fisheries has shown that many aspects of the fishing experience that are non-catch related influence angler satisfaction. However, satisfaction as an independent metric may fail to produce sufficient information regarding perceptions of fishing quality, which may be a more salient component of the fishing experience from a management perspective. Therefore, this study focused on what influences fishing quality in the minds of anglers. We used data collected from a year-long, on-site survey of anglers at the Marben Public Fishing Area (PFA) near Mansfield, Georgia, USA, in an ordinal logistic regression model to investigate angler perceptions of fishing quality. Anglers ranked the quality of fishing at Marben PFA as 6.45 (SD = 2.19) on a 1–10 scale, and significantly higher ( $t = 5.79$ ,  $df = 803$ ,  $P = 0.001$ ) than similar fishing sites with comparable access costs. Results showed that as anglers caught more fish of their target species, they were more likely to report significantly higher ratings of fishing quality. Anglers expressing dissatisfaction with poor catch rates, anglers that fished from piers, and anglers that advocated changes to management were all more likely to report lower quality of fishing ratings than their counterparts. The probability of reporting higher fishing quality ratings also increased significantly with longer driving distance. The results suggest that perceptions of fishing quality are strongly influenced by the catch-related aspects of the fishery and these attributes would serve as suitable criteria for guiding future management efforts at this fishery and among similar fisheries elsewhere. Quantitative assessments of both angler satisfaction and perceived fishing quality will likely produce more clear and meaningful results for managers to describe angler communities and guide fisheries management decisions.

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A primary goal of recreational fisheries management is to produce and maintain quality sportfish stocks for the angling public (Pollock et al. 1994, McCormick and Porter 2014). Within recreational fisheries, fishing quality traditionally has been defined and evaluated by metrics that quantify angler fishing success. These metrics include catch and harvest rates, size structure (e.g., stock densities), and body condition (e.g., relative weights) of the fish population. These population metrics are used widely by fisheries management agencies to gauge the quality of their fisheries and predict the effects of management actions on angler success and value of fishery (Colvin 2000, Hickman 2000, Curtis and Stanley 2016). By improving the quality of fishing, managers hope to increase the collective fishing satisfaction of anglers.

Angling satisfaction is, however, influenced by many situational and exogenous factors that are independent of the catch-related aspects of fishing, including achieving psychological outcomes like stress release and relaxation (Fedler and Ditton 1994, Dabrowska

et al. 2014), social motivations including bonding and quality time (Arlinghaus and Mehner 2004) and outdoor motivations, where anglers employ fishing primarily as a means to immerse themselves in a natural setting (Manfredo et al. 1984, Holland and Ditton 1992, Spencer 1993). Thus, a key disparity has been identified between main objectives related to management of fisheries (e.g., a success rate) and non-catch factors that have been demonstrated to influence angler satisfaction with a fishing trip (Hampton and Lackey 1976, Holland and Ditton 1992, Spencer 1993, Arlinghaus 2006). Ultimately, there is now an understanding that high angler satisfaction cannot be achieved solely by manipulating supply-side factors such as available facilities, fish stocks, water quality, and access because angler satisfaction is also influenced by several demand-side factors (e.g., recreational motivations) that do not always fall within the scope of management (Weithman 1999, McCormick and Porter 2014).

Although fishing trip satisfaction is a common endpoint of inter-

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est in fisheries management, another construct—perception of fishing quality—may better inform biologists about the effectiveness of management efforts. Because a general goal of fisheries management is to produce fisheries of a desirable quality for anglers, a reasonable understanding of what determines fishing quality in the mind of anglers themselves should precede management action. Fishing satisfaction often remains the focus in many studies of recreational anglers (Holland and Ditton 1992, Spencer 1993, Arlinghaus 2006, McCormick and Porter 2014), but studies examining angler perceptions of fishing quality are underexamined. Satisfaction with a fishing trip may not equally reflect a subjective perception of fishing quality, which may be a more salient measure of the angler's fishing experience from a management perspective. Because fishing quality can be one controllable component of the fishing experience (i.e., managers can manipulate populations, habitats, and regulations to produce desirable stock structures; Fisher 1997, Fedler and Ditton 1994), evaluating factors that influence angler perceptions of fishery quality could provide useful guidance towards improving anglers' fishing experiences.

Although there is no standard procedure for measuring satisfaction levels in outdoor recreation (Burns et al. 2003), a general model of satisfaction has been described as a function of two separate groups of variables: situational variables and the subjective evaluations of the recreationist (Graefe and Fedler 1986, Whisman and Hollenhurst 1998). Situational variables are activity general (Driver and Cooksey 1977, Fisher 1997) and include relaxation, social interaction with family and friends, and being outdoors. Subjective evaluations are numerous and include socioeconomic and cultural characteristics, experience evaluations, attitudes and preferences, subjective norms, and crowding and risk perception (Whisman and Hollenhurst 1998, Manning 1999). This general model has been further refined and used to identify important factors affecting satisfaction across a wide variety of recreationists including anglers (Graefe and Fedler 1986, Vaske et al. 1986, Herrick and McDonald 1992, Whisman and Hollenhurst 1998). In this paper, we followed the theoretical framework previously used in modeling recreationists' rating of trip satisfaction to guide our analysis of variables that influence angler perceptions of fishing quality at a state-owned, multi-lake fishery in Georgia. The objectives of this study were to 1.) solicit angler opinions regarding quality of fishing at this fishery and 2.) identify factors related to differential quality of fishing ratings among anglers. We hypothesized that, through assessment of the subjective evaluations of anglers, angling metrics, and the situational variables believed to shape angler perceptions of fishing quality, we can develop a basic understanding of what factors are important in influencing angler perceptions of fishing quality at this fishery.

## Methods

### Study Area

Marben Public Fishing Area (Marben PFA) is managed by the Fisheries section of the Georgia Department of Natural Resources' Wildlife Resources Division (DNR WRD) and located within the Charlie Elliot Wildlife Center in Mansfield, Georgia. Marben PFA comprises 22 ponds and lakes ranging in size from 0.4 to 40 ha. During this study, several impoundments were closed for fishing or not accessible and therefore only 14 of the 22 impoundments were included in the survey. The fishery was regulated with relatively conservative (compared to statewide regulations) creel limits of 5 fish for channel catfish (*Ictalurus punctatus*), 15 sunfish (*Lepomis* spp.), 30 black crappie (*Pomoxis nigromaculatus*), and 5 largemouth bass (*Micropterus salmoides*) which are further regulated by a 35.5-cm minimum size limit. Some ponds were managed with special regulations (e.g., fishing for children only). Anglers targeted largemouth bass (25%) and sunfish (31%) as primary target species, followed by black crappie (19%), "anything" (16%), and channel catfish (9%) (Roop et al. 2018). Except for annual trip estimates, little information had been gathered from Marben PFA anglers regarding angler use and preferences for management of the fishery prior to this survey.

### Sampling Design and Data Collection

Data for this study were collected through an on-site survey of anglers at Marben PFA. First, a 27-item angler survey was developed, approved by the University of Georgia's Institutional Review Board and pretested on 23 anglers prior to implementing the survey in 2013. The survey<sup>3</sup> included questions regarding the angler's fishing activity that day, typical fishing habits at the PFA, opinions and preferences regarding policy and management at the PFA (Table 1), and demographic information (e.g., gender, age, ethnicity, zip code). Anglers were also asked to rate the quality of fishing at Marben PFA on a scale from 1 (poor quality) to 10 (excellent quality). Anglers were then asked to rate the quality of fishing for other comparable fisheries within roughly the same driving distance from the angler's residence.

Angler surveys were conducted from 1 January to 31 December 2013 to ensure that the sample included anglers visiting each season of the year. A roving survey based on a multi-stage, non-uniform probability sampling technique (Pollock et al. 1994, Malvestuto 1996, Vaske 2008) was adopted to intercept fishermen on site (e.g., boat, bank, pier). Multi-stage sampling was chosen because angler visitation varied considerably among seasons, weeks, and

3. Entire survey available from authors upon request

**Table 1.** A subset of survey questions and available response options used to identify factors affecting anglers' fishing satisfaction and solicit opinions regarding fisheries management at Marben Public Fishing Area in Mansfield, Georgia, in 2013.

Variable	Question asked	Response options	
Participation	Do you typically participate in any activities other than fishing (e.g., bird watching, hunting, hiking) at Charlie Elliot Wildlife Center?	Hunting Shooting Birdwatching	Hiking Biking Camping  Other
Water level	Considering fishing at Marben PFA, does the water level being too high or low take away from your fishing satisfaction?	Yes	No
Poor catch	Considering fishing at Marben PFA, does difficulty catching enough fish take away from your fishing satisfaction?	Yes	No
Crowding	Considering fishing at Marben PFA, does crowding take away from your fishing satisfaction?	Yes	No
Behavior	Considering fishing at Marben PFA, does poor behavior of other anglers take away from your fishing satisfaction?	Yes	No
Operating hours	Considering fishing at Marben PFA, do operating hours take away from your fishing satisfaction?	Yes	No
Access	Considering fishing at Marben PFA, does poor access to fishing areas take away from your fishing satisfaction?	Yes	No
Water quality	Considering fishing at Marben PFA, does water quality or pollution take away from your fishing satisfaction?	Yes	No
Regulations	Considering fishing at Marben PFA, do difficult or complex regulations take away from your fishing satisfaction?	Yes	No
Management.1	Do you believe that Marben PFA lakes should be managed for more fish, larger fish, or both?	More fish  Both	Larger fish
Management.2	The daily creel limits are five bass, five catfish, 30 crappie, and 15 bream. Are changes needed for each species?	Unchanged Increased	Reduced No opinion
Size limit	The length limit on Largemouth Bass is currently 14", do you feel this should be eliminated, unchanged, reduced, or increased?	Eliminated Reduced	Unchanged Increased

time of the day. During each month, 10 sampling periods were randomly selected among six different temporal strata combining day type (e.g., weekday, weekend), and one of three 5-h time blocks (AM, noon, PM). A holiday stratum was not used in the survey design because Marben PFA is closed for fishing on Mondays and Tuesdays, and most (70%) Federal holidays occurred on a Monday or Tuesday during this study. Probabilities were determined by *a priori* visitation rates calculated at the beginning of each month. On selected sampling days, a single creel clerk traveled on foot or by boat throughout the fishery (i.e., from lake to lake) sequentially interviewing anglers or a representative of an angling party within the closest walking/boating distance. To avoid repeated sampling

of individuals and redundancy in their responses, repeat anglers, who provided their evaluation previously, were only asked to provide their creel data (e.g., hours fished, target species, methods, fish caught). Similarly, first-time visitors to the PFA only provided their creel data because of concerns that their limited experience precluded an informed opinion regarding the fishery and its management.

### Analysis

Descriptive statistics (sample means, errors, and percentages) were used to analyze anglers' responses to individual questions on the survey. A one sample *t*-test was used to assess differences between average fishing quality ratings for Marben PFA and the quality of fishing scale average of 5.5. An independent samples *t*-test was used to compare the average fishing quality ratings for Marben PFA against alternative fishing sites that could be accessed at a comparable cost. The assumption of normality for these tests was relaxed given the large sample size (Vaske 2008).

The Polytomous Universal Model (PLUM) procedure in the Statistical Package for Social Sciences (SPSS) for ordinal logistic regression was used to identify variables that were significantly related to anglers' perceived quality of fishing (Norušis 2005). Ordinal regression analysis is appropriate for categorical dependent variables with an ordinal structure (i.e., categories are ranked relative to each other but have no known interval measure between each category: Vaske 2008). The ordinal regression model of perceived quality of fishing was specified and estimated as follows:

$$Y_i^* = X_i' \beta_k + \mu_i \tag{1}$$

Where,  $Y_i^*$  is the latent variable that cannot be observed directly but is represented by the true outcome (1—poor quality, 10—excellent quality). Similarly,  $\beta_k$  represents the regression parameter to be estimated for the  $k_{th}$  explanatory variables,  $X_i$  represents the matrix of explanatory variables, and  $\mu$  represents the random component of the regression model.

Developing the multivariate model began with the creation of dummy variables for dichotomous categorical explanatory variables (e.g., response was assigned 1 for a "yes" answer and zero for a "no"). A Pearson's correlation matrix was used to identify correlated variables, and if two variables were highly correlated (i.e.,  $r \geq |0.70|$ ; Vaske 2008), one of these variables was removed from the analysis. Highly correlated variables were removed if they were logically assumed to be dependent on another explanatory variable, or if one of the two variables was less meaningful than the other from either a biological or theoretical perspective. Initially, all explanatory variables hypothesized to significantly influence anglers' perceptions of fishing quality were considered as covari-

**Table 2.** Description of variables initially hypothesized to influence anglers' attitudes towards fishing quality at Marben Public Fishing Area in Mansfield, Georgia, during 2013.

Variable	Description	Mean
<b>Angling metrics</b>		
Fish catch†	Total number of fish caught	5.07 (9.17)
Weight	Total weight of fish harvested (kg)	0.41 (0.91)
Fish harvest††	Total number of fish harvested	2.37 (5.62)
Bycatch	Number of non-target fish caught	1.00 (3.20)
Target catch	Total number of target species caught	4.08 (8.24)
<b>Subjective evaluations</b>		
Participation	Dummy variable, 1 if angler participated in other recreational activities, else 0.	0.32 (0.47)
Water level	Dummy variable, 1 if high/low water levels took away from satisfaction, else 0.	0.17 (0.37)
Poor catch	1 if "difficulty getting enough catch" took away from satisfaction, else 0.	0.32 (0.47)
Crowding behavior	1 if crowding took away from satisfaction, else 0.	0.06 (0.24)
	1 if negative behavior of anglers took away from satisfaction, else 0.	0.07 (0.25)
Operating hours	1 if reduced operating hours took away from satisfaction, else 0.	0.26 (0.44)
Access	1 if poor access to fishing areas took away from satisfaction, else 0.	0.09 (0.28)
Water quality	1 if poor water quality took away from satisfaction, else 0.	0.04 (0.20)
Regulations	1 if difficult fishing regulations took away from satisfaction, else 0.	0.01 (0.10)
Management.1	1 if angler believed lakes should be managed for more and/or larger fish, else 0.	0.89 (0.32)
Management.2	1 if angler believed creel limit should increase for their target species, else 0.	0.19 (0.39)
LMB size limit	1 if angler advocated liberalized size limit for LMB, else 0.	0.20 (0.40)
<b>Situational variables</b>		
Gender	1 if male, else 0.	0.89 (0.31)
Age	Angler age.	50.2 (14.1)
Median income (thousands)	Median income determined by zip code.	\$51.5 (\$12.0)
Distance	Driving distance travelled determined by zip code.	35.8 (28.4)
Ethnicity	1 if angler was Caucasian, else 0.	0.57 (0.50)
Party	Number of anglers in party	2.0 (1.1)
Boat	1 if fishing from boat, else 0.	0.20 (0.43)
Bank <sup>a</sup>	1 if fishing from bank, else 0.	0.70 (0.47)
Pier	1 if fishing from pier, else 0.	0.10 (0.28)
Trips	Number of fishing trips taken in last year (2012)	13.4 (22.70)
Years	Number of years angler has fished at Marben PFA	8.6 (7.7)

a. Pearson  $r > 0.70$

ates (Table 2). The backwards elimination approach (Vaske 2008) was used to remove independent variables that were not significantly related to perceived quality of fishing. The assumption of parallel lines was tested by evaluating the difference of the log-likelihood for the null and observed (general) model, which produced a Chi-square statistic. Goodness-of-fit was evaluated by examining the significance of Pearson and Deviance Chi-square values. The overall test of the null hypothesis that the explanatory variables'

coefficients were zero was also conducted using a Chi-square test. Rejecting the null hypothesis of this test means that the model with predictors is more useful than the model without predictors. Lastly, the Cox and Snell pseudo R-squared statistic was used to evaluate the explanatory ability of the model. All hypothesis tests were conducted with an alpha of 0.05.

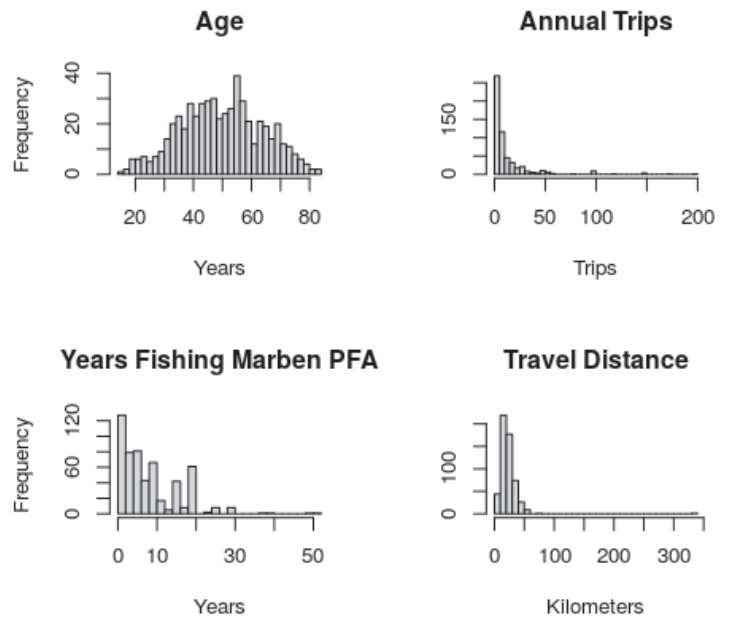
**Results**

**Survey Response and Angler Characteristics**

From January to December 2013, 115 roving surveys were scheduled. However, 12 surveys were cancelled as a result of inclement weather, and so 103 on-site roving surveys were completed during the survey period. The overall response rate during the survey period was 96% (1150 out of 1204 anglers contacted in the survey). However, 450 anglers were repeat interviewees and 149 anglers were first time visitors. Thus, the final sample size of completed interviews was 551. Of note, most (89%) of anglers surveyed were male; however, 56% were Caucasian and 41% were African American. While angler age was normally distributed, annual trips, experience fishing at Marben PFA, and driving distance were positively skewed (Figure1).

**Anglers' Perception of the Fishery**

Anglers ranked the quality of fishing at Marben PFA a 6.45 (SD=2.19), which was significantly higher ( $t=5.79$ ,  $df=803$ ,  $P=0.0001$ ) than average fishing quality rankings of 5.46 (SD=2.36)



**Figure 1.** Frequency distributions of age, annual fishing trips, experience fishing, and travel distance for anglers surveyed at Marben PFA in Mansfield, Georgia, during 2013.

assigned for substitute fishing sites and significantly higher ( $t = 10.20$ ,  $df = 546$ ,  $P = <0.0001$ ) than the scale average of 5.5. When asked if they believed the quality of fishing had changed at Marben PFA since their first visit, 40% of anglers believed fishing quality remained the same, 32% thought fishing quality had declined, 19% thought fishing quality improved, and 9% were unsure. When asked to identify factors that negatively influenced their fishing satisfaction, 32% of anglers selected “difficulty catching enough fish,” 26% selected “operating hours,” and 17% selected “water level too high/low”; all other factors were selected less than 10% of the time. Most anglers were satisfied with creel limits for black crappie (80%), bream (70%), channel catfish (61%), and largemouth bass (76%), and 70% of anglers believed that the current 35.5-cm minimum size limit for largemouth bass should remain unchanged.

**Ordinal Logistic Regression**

The final model identified five variables that were significantly related to perceived quality of fishing rankings, and one variable (ln[distance]) was marginally significant (Table 3). The test of parallel lines failed to reject the null hypothesis that relationship between independent variables and the logits were equal for all logits ( $\chi^2 = 44.72$ ,  $P = 0.608$ ). Significance of goodness of fit  $\chi^2$  values did not agree between Pearson ( $P = 0.026$ ) and Deviance ( $P = 1.00$ ) statistics. This disagreement in goodness of fit was likely because the model had multiple predictor variables, including two continuous predictor variables that resulted in many cells (87.6%) with zero frequencies (small expected values). However, the overall model test was significant ( $\chi^2 = 119.5$ ,  $P = 0.0001$ ), which suggested that the model with predictors was better than the “intercept only” model. The Cox and Snell pseudo  $R^2$  was 0.197. Total target catch, the only significant covariate in the model, was positively related to angler’s perception of fishing quality. The ln (distance) was also positively related to anglers perceived quality of fishing; however, this variable was not significant ( $P = 0.065$ ) and therefore may not

actually influence anglers’ perception of fishing quality. The dummy variables fishing from a pier, ethnicity, poor catch, and the anglers’ perception of current size and number limit at Marben PFA were all negatively related to angler’s perception of fishing quality, indicating an inverse relationship with the probability of reporting a high quality of fishing rating.

**Discussion**

Our use of an exploratory multivariate ordinal regression approach to identify variables that were significantly related to angler perceptions of fishery quality provided new information about anglers’ attitudes and preferences about fishing quality at Marben PFA. Most anglers indicated an above-average perception of fishery quality, and most of the variables initially included in the model were not significantly related to fishing quality rankings. The results of this analysis suggest that situational variables (i.e., anglers’ subjective evaluations of the fishery) and angling metrics can be useful in determining what shapes angler perceptions of fishing quality. At least one variable from each factor was significantly related to quality of fishing ratings, which suggests that perceived quality is similar to satisfaction with regard to its complexity and multifaceted nature (Crompton and Mackay 1989, Vaske 2008). The results from this survey have implications relevant to both Marben PFA and the management of recreational fisheries in general.

Fishing is goal-oriented and often consumptive (with the exception of catch-and-release fisheries), and achievement of the goal such as catching or keeping a fish should produce some degree of satisfaction to the angler (Vaske 2008). Studies have demonstrated that fishing success (i.e., catching a fish) is important in determining fishing satisfaction (Miller and Graefe 2001, Arlinghaus 2006, McCormick and Porter 2014). Likewise, the results of our study suggested that anglers were more likely to have a positive perception of fishing quality when they caught increasing numbers of their target species. Anglers who reported that difficulty catching enough fish affected their fishing satisfaction were also likely to report lower quality of fishing scores. Therefore, angler success was shown to be an important determinant of fishing quality perceptions in this study.

Anglers who believed Marben PFA should be managed for more numbers and larger sizes of particular species assigned lower fishing quality rankings, on average, than anglers who had no opinion or were satisfied with the current management strategy. Though this result may be expected, it further validates the notion that angler perceptions of fishing quality are related to the characteristics of the fishery in question. For example, anglers who fished from a pier were more likely to report lower quality of fishing ratings than anglers fishing from a boat or bank. This finding may

**Table 3.** Definition of variables used and ordinal regression coefficients that describe the odds of reporting a higher quality of fishing rating for anglers surveyed at Marben Public Fishing Area in Mansfield, Georgia, during 2013.

Variable	$\beta$	Exp ( $\beta$ ) odds ratio	P-value
Total target catch <sup>a</sup>	0.32	1.03	0.001
ln (distance) <sup>b</sup>	0.22	1.24	0.065
Pier <sup>b</sup>	-0.58	0.55	0.027
Ethnicity <sup>c</sup>	-0.43	0.65	0.012
Poor catch <sup>c</sup>	-1.38	0.25	0.001
Management strategy <sup>c</sup>	-0.77	0.46	0.002

a. Fishing metric  
 b. Situational variable  
 c. Subjective evaluation

be related to the higher probability of crowding among pier anglers, which has been shown to negatively affect angler experience (Vaske and Donnelly 2002, Yow et al. 2008, Needham et al. 2014). However, only 6% ( $n = 34$ ) of anglers identified crowding as a factor that took away from their fishing satisfaction at Marben PFA. Furthermore, only two of the anglers who considered crowding to negatively affect their fishing satisfaction were angling from a pier. Hence, the negative perception of fishing quality among pier anglers was more likely related to lower catch-related fishing success by pier anglers. Piers naturally restrict the angler's ability to fish the entire impoundment, likely leading to lower-than-average catch rates. Although catch and harvest rates were similar among pier, boat, and bank anglers (Roop et al. 2018), 40% of pier anglers in this study believed that poor catch detracted from their fishing satisfaction; whereas, only 31% of bank anglers and 32% of boat anglers believed the same. Therefore, pier anglers may believe that their catch rates are insufficient even if rates actually match those of other anglers.

Demographics of respondents also may affect their perceptions of fishing quality. In our results, for example, the negative coefficient for the variable "ethnicity" suggests that Caucasian anglers tended to assign lower quality of fishing rankings than non-white anglers. Therefore, white anglers at Marben PFA may have had a slightly lower perception of the quality of fishing than non-white anglers, and although the coefficient was statistically significant, the effect size was relatively small. More importantly, however, this finding contributes to a growing body of literature regarding differences among races/ethnicities in outdoor recreation. General demographic variables, although useful in quantifying and describing user groups, do not usually exhibit strong predictive capabilities from a modeling perspective (Vaske 2008). Still, studies have found that recreational fishing concerns differ among ethnic groups regarding behavior (Burger et al. 2006), attitudes (Hunt et al. 2007), perceptions (Hunt and Ditton 2001), and participation (Toth and Brown 1997, Hunt and Ditton 2002, Floyd et al. 2006). Thus ethnicity based differences in quality perceptions certainly warrants further consideration. Specific behavioral and preferential differences between white and nonwhite anglers from this study can be found in Roop et al. (2020). Soliciting information on the beliefs of anglers regarding the quality of fishing based on multiple criteria (e.g., fish abundance, individual size, species available, and access opportunities) may allow future studies to examine differences in quality perceptions among sociodemographic groups with a higher degree of resolution and precision.

Few studies have attempted to identify variables that are related to and explain variation in angler perceptions of fishery quality. Our results demonstrated that perceptions of quality are similar to

satisfaction with respect to its multifaceted nature. Because of this complexity, simply asking anglers a single question regarding their perception of overall fishing quality is probably insufficient to specifically guide management efforts. Alternatively, the individual components that determine overall fishing quality should also be investigated separately (e.g., number/diversity of species, success rates, number of harvestable fish, average length of fish caught) to determine what elements are strong predictors of overall quality and characterize the angling population (i.e., by harvest orientation, specialization, or motivations). Certainly, these elements would be expected to change among different fisheries according to their unique characteristics. Similarly, measuring quality at its component levels would potentially reveal mechanisms for variation in perceptions of overall quality among specific user groups (e.g., race/ethnicity, age-group, specialization level). Considering the general decline in nature-based recreation participation in America (Kareiva 2008, Pergams and Zaradic 2008) and the need to understand preferences for recreationists, especially for growing minority groups (Rodriguez and Roberts 2002), developing tools to adequately discern particular fishing preferences among user groups will be essential for continuing the success of fisheries management programs nationwide.

Our work could be tested and further refined through future studies that simultaneously assess angler perceptions of fishing quality and angler fishing satisfaction. Including measures of stated satisfaction and perceived quality would likely help us understand the strength of the association between satisfaction levels and quality perceptions while also understanding how different elements of the fishing experience influence both measures. Ascertaining which criteria (i.e., measuring fishing quality perceptions, satisfaction, or both) is relevant to management of recreational fisheries is important. Although similar variables may influence satisfaction and quality perceptions, overall fishing satisfaction could be expected to be better explained by factors related to angler motivations, fishing preferences, expectations, and specializations. Conversely, the catch-related aspects of the fishing trip and the general characteristics of the angler might better explain quality perceptions. By using this multidimensional approach, anglers may experience greater benefits of fishery management as their desires are better understood and accommodated.

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