Using Angler Diaries to Assess Catch and Harvest Trends for Blue Catfish and Flathead Catfish in a Missouri Reservoir

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Abstract: The Missouri Department of Conservation suspected that blue catfish (*Ictalurus furcatus*) and flathead catfish (*Pylodictis olivaris*) were being heavily exploited by anglers in the 22,501-ha Harry S. Truman Reservoir in west-central Missouri. A volunteer catfish angler creel was conducted during 2003–2005 to assess catch, harvest trends, and the proportional contribution of the two catfish species to the overall catfish fishery by reservoir catfish anglers. Following recruitment, a total of 308 volunteers were trained and then asked to fill out daily diary forms after each catfishing trip. Volunteers were asked to supply fish length and harvest information for their catch and the catch of all members of their fishing party as well as a trip rating. Anglers who actively participated in the program were entered into a random drawing at the end of each fishing season and received prizes ranging in value from US$15 to $100. A total of 138 anglers (45% of the volunteers) actively participated in the program by turning in at least one diary. Catch and harvest data were collected from 1055 diary forms and 2232 catfish angler trips. Anglers reported length and harvest information on 5920 catfish (including channel catfish) and reported catching nearly 10 times more blue catfish (3759) than flathead catfish (397). Anglers who targeted blue catfish caught 2.7 blue catfish per angler trip while anglers who targeted flathead catfish caught 0.3 flathead catfish per angler trip. Only 20% and 13% of blue catfish and flathead catfish, respectively, were caught with pole and line. Forty-one percent of volunteer anglers assigned a poor rating to their fishing trips. These results were used along with results from a concurrent exploitation study to recommended regulation changes to protect the blue catfish fishery at Truman Reservoir.

Key words: angler creel, volunteers, regulations

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Collecting quality data on annual catch, harvest, and angler effort for catfish fisheries is often problematic for fisheries managers. Direct, on-site interview creel surveys are typically conducted during daylight hours, are expensive and time consuming (Isermann and Paukert 2010) and may not always encounter adequate numbers of catfish anglers. Because of the limitations of daytime on-site interview creel surveys, some fishery managers have conducted nighttime creel surveys on smaller impoundments where the size of the water body allowed full coverage by survey clerks. Parrett et al. (1999), for instance, conducted an on-site angler creel survey over 24-h periods on two Ohio impoundments to compare nighttime and daytime creel results and concluded that because of the influence of nighttime fishing, standard daytime creel surveys may underestimate the numbers of catfish anglers and total catfish catch. However, nighttime creel surveys are difficult to conduct in larger systems with multiple access points.

Others have conducted on-site and off-site volunteer angler surveys using a variety of low-cost methods to help assess the status of fish populations, angler success rates, angler demographics, seasonal catch trends, regulation efficacy, and angler satisfaction. Weiss-Glanz and Stanley (1984) used angler cards and catch booklets to evaluate largemouth bass (*Micropterus salmoides*) and smallmouth bass (*M. dolomieu*) population size structure at several water bodies in Maine. The authors concluded that using angler supplied reports was an effective and efficient method to collect length frequency information, especially from water bodies where electrofishing was ineffective. Willis and Hartman (1986) summarized data collected as part of the Kansas Black Bass Tournament Monitoring Program from 1977–1984, where Kansas officials utilized tournament record forms to collect black bass catch information from bass clubs. Gabelhouse and Willis (1986) followed up on this study by comparing these data with stratified data from a random creel survey.

Chambers (1993) conducted a 3-yr angler-diary survey on five reservoirs in the Yadkin-Pee Dee River system in North Carolina to examine the quality of the fishery by using angler catch rates, size distribution, and condition factors of flathead catfish (*Pylodictis olivaris*). VanDeValk et al. (2007) used the complete trip data from an angler diary program to examine the influence of party size and trip length on angler catch rates for several sportfish species at Oneida Lake, New York. Statewide angler-diary programs have been implemented and compared to results from traditional sampling data in Texas and Mississippi (Prentice et al. 1993, Bray and Schramm 2001). In both cases, the agencies noted that these programs provided data at a much lower cost and were useful in monitoring angler catch-rate trends, but that they should not re-

place traditional fishery assessment data. Although straightforward and inexpensive, self-reported data has obvious biases such as exaggeration, misreported lengths, misinterpreted survey questions, high non-reporting rates by volunteers, and non-random selection of participants (Pollock et al. 1994). However, many biologists have found volunteer angler information to be a reasonable and inexpensive option to assess certain aspects of a fishery, particularly trends in angler success and the size structure of angler-caught fish.

Beginning in the mid 1990s, the Missouri Department of Conservation (MDC) suspected that blue catfish (*Ictalurus furcatus*) and flathead catfish were being over-exploited by recreational anglers in Harry S. Truman Reservoir (hereafter, Truman Reservoir) in west-central Missouri. Since its impoundment in 1979, Truman Reservoir has been extremely popular with catfish anglers. High angler catches in conjunction with perceived high fishing pressure caused concern for MDC officials. During the mid 1990s MDC received numerous reports by anglers of "excessive" legal and illegal catfish harvest. Many anglers also stated a concern over what they perceived to be a decline in the numbers of large blue catfish. In response, MDC conducted a comprehensive management evaluation project from 2003–2009 to evaluate the blue catfish and flathead catfish fisheries in Truman Reservoir. The objective of this study was to use a volunteer catfish angler creel to assess angler catch, catch rates, and harvest trends for blue catfish and flathead catfish and to assess overall angler satisfaction with the fishery.

Methods

Study Site

Truman Reservoir is the largest flood control impoundment in Missouri, covering 22,501 ha at multipurpose pool and 84,701 ha at full flood pool (U.S. Army Corps of Engineers 2012). Lake of the Ozarks (22,397 ha) is immediately downstream of Truman Reservoir and together they account for the majority of large reservoir blue catfish fishing in Missouri. During this angler creel study, anglers were allowed to keep 10 channel catfish and blue catfish in aggregate daily and 5 flathead catfish daily, without length limits. In addition to pole and line, anglers were allowed to use set line methods such as jugs, trot lines, and limb lines, with a limit of 33 hooks per licensed angler. Commercial fishing is not permitted on the reservoir.

Angler Recruitment and Training

Volunteer catfish anglers were recruited annually during 2003–2005 to participate in the volunteer catfish creel survey. Anglers were recruited through several avenues, the most successful of which was posting announcements on the MDC web site. After explaining what was expected of those who participated, prospective volunteers were informed that each active participant would receive an incentive prize ranging in value from US$15 to $100 at the end of the fishing season. Two of the available prizes were valued over $50, but most were valued at $20 to $30. Prizes were drawn randomly, so all active participants had an equal chance for the more valuable prizes. A volunteer was considered an active participant if they turned in at least one diary form during the year. Some of the incentive prizes were obtained through donations by local merchants, while others were purchased by MDC. Due to the aforementioned biases of non-random participation when using a volunteer program, the widest possible range of anglers was recruited. Anglers were allowed to participate in the survey regardless of how often they fished for catfish, their level of catfishing experience, what fishing method(s) they used, where on the reservoir they fished, or the species of catfish they typically targeted. The only requirement for participation was that they actively fished for catfish. Channel catfish anglers were an important part of the volunteer angler base as they often catch blue catfish when targeting channel catfish, but study results were focused on blue catfish and flathead catfish. The creel period ran from 1 April through 31 October in each of the three years. Volunteers were given detailed training before the creel period began on how to complete the daily diary sheets. They were asked to report catch data for themselves and for all anglers that fished with them on that day. They were asked to measure all catfish to the nearest 12.7 mm and to clearly designate which catfish were harvested and which were released. Finally, they were asked to provide an overall rating for that particular day's fishing trip, using the four subjective categories excellent, good, fair, and poor. To reduce the non-reporting bias generally associated with unsuccessful fishing trips, volunteers were encouraged to turn in diary forms even when they did not catch fish.

In addition to verbal training, volunteers were given written instructions and numerous written examples of how to fill out the diary forms. The diary form itself had an abbreviated example of how to record catfish that were harvested and released. Blank forms and self-addressed postage paid envelopes were provided to all volunteers at the beginning of the season to make returning diary forms convenient and cost-free. Anglers were also given the option to fill out an electronic diary form and email it to MDC throughout the study. In 2005, an online version of the diary form was made available to all active volunteers. To prevent unsolicited online entries, the diary form was available on the MDC web site, but only through a dedicated and non-public web address. At the end of each creel season, all active participants were provided with a written summary of the creel results from that year.

Data Entry and Analysis

The mean lengths of harvested and released fish, with corresponding standard error values (SE) were reported for both species each season as well as across the 3-yr creel period (Zar 1999). The lengths of harvested and released fish for both species were plotted with length frequency histograms, and two-tailed *t*-tests were used to test for differences in the means of these length distributions (Zar 1999). Two-sample Kolmogorov Smirnov (KS) tests were conducted for both species to determine if the length distribution of harvested fish was similar to released fish and to determine if the length distribution of fish caught with pole and line was similar to those caught with setlines (R Development Core Team 2008). Estimated weights were calculated using $\log^{10}$ linear regressions (Zar 1999) derived from 2610 blue catfish and 7586 flathead catfish sampled across Missouri.

Percent harvested and released and proportion of each species caught by different angling methods were reported. The mean number of anglers per catfishing party, mean length of angler trip, effort, catch, and catch rates by species preference were also calculated. Angler trip ratings, as a percentage of the total response, were analyzed for each year and over the entire 3-yr creel period. All means comparisons were tested with a two-tailed *t*-test (Zar 1999). Categorical count data were analyzed using chi-square analysis. All statistical comparisons were considered significant at $P \leq 0.05$.

Results

A total of 308 volunteers agreed to participate over the course of the 3-yr angler creel survey with a mean of 102.7 volunteer anglers participating each year (Table 1). Forty-nine volunteers from 2003 returned to participate in 2004 (50% return rate), while 60 volunteers from 2004 returned to participate in 2005 (52% return rate). Thirty-four volunteers participated all three years of the study. Of the 308 volunteers, 138 returned at least one angler diary over the course of the entire study; on average, 46 anglers returned at least one diary each yr, corresponding to a mean annual active participation rate of 45%. Anglers returned a total of 1055 diary forms over the 3-yr period (mean = 352 annually). The number of diaries returned by individual volunteers in a year ranged from 1 to 58 (mean = 7.7 per active volunteer per yr). The number of catfish anglers per fishing party was 2.1 in all three yrs of the program. Anglers reported catfish catch and harvest data from a total of 2232 catfishing trips (mean = 744 annually).

Volunteers reported length and harvest data from 4156 blue catfish and flathead catfish over three years (mean = 1386 annually) and 90% were blue catfish. In contrast, anglers caught a total of 397 flathead catfish over three years (mean = 132 annually). Overall, anglers caught 1.9 blue catfish and flathead catfish per trip over the 3-yr creel period.

Table 1. Summary of angler participation and catch data for blue catfish and flathead catfish from the volunteer catfish angler creel survey at Truman Reservoir 2003–2005. Standard errors are shown in parentheses.

	2003	2004	2005	Total	Mean
Signed-up volunteers	97	115	96	308	102.7 (6.2)
Number of volunteers who turned in ≥1 diary	41	49	48	138	46 (2.5)
Total diaries turned in	360	351	344	1,055	351.7 (4.6)
Diaries turned in/year by volunteers	8.8	7.2	7.2	–	7.7 (0.5)
Anglers per fishing party	2.1	2.1	2.1	–	2.1 (0.0)
Catfishing trips reported	765	752	715	2,232	744 (15.0)
Total blue catfish—all methods	1,395	1,378	986	3,759	1,252.3 (133.6)
Total flathead catfish—all methods	137	141	119	397	132.3 (6.8)
Total blue and flathead catfish—all methods	1,532	1,519	1,106	4,156	1,385.7 (139.9)
Blue/flathead catfish per angler trip	2.0	2.0	1.5	–	1.9 (0.1)

Table 2. Catch and harvest/release data for blue catfish reported by all anglers during the volunteer catfish angler creel survey at Truman Reservoir 2003–2005. Standard errors are shown in parentheses.

	2003	2004	2005	Total	Mean
Total reported by all methods	1,395	1,378	986	3,759	1,253 (133.6)
Mean length (mm) caught	517(4.3)	488(4.4)	503(4.8)	–	502.5 (2.6)[a]
Estimated mean weight (kg)	1.3	1.1	1.2		1.2 (0.1)
Total number harvested	684	884	639	2,207	735.7 (75.3)
Total number released	711	494	347	1,552	517.3 (105.7)
Mean length (mm) harvested	590(5.3)	557(5.1)	552(5.7)	–	565.7 (3.1)[a]
Estimated mean weight harvested (kg)	2.0	1.7	1.6	–	1.8 (0.1)
Mean length (mm) released	446(5.6)	364(4.4)	412(6.2)	–	412.6 (3.4)[a]
Estimated mean weight released (kg)	0.8	0.5	0.6	–	0.6 (0.1)
Catch rate per angler trip	1.8	1.8	1.4	–	1.7 (0.1)
Total reported by pole/line	121	462	183	766	255.3 (104.9)
Total reported by setlines	1,274	916	803	2,993	997.7 (142.0)

a. Mean across all years.

Anglers caught a total of 3759 blue catfish, of which 59% were harvested (Table 2). Anglers harvested significantly more blue catfish annually (mean = 736 annually) than they released (mean = 517 annually; $\chi^2 = 85.8$, $P < 0.05$). The mean length for all blue catfish caught by anglers was 503 mm TL and the estimated mean weight was 1.2 kg based on Missouri standard weight equations. The lengths of blue catfish harvested (mean = 566 mm TL or 1.8 kg) were significantly larger than those released (mean = 413 mm TL or 0.6 kg; $t = 33.4$; $P < 0.05$). The length distributions of harvested and released blue catfish were plotted in a length frequency histogram (Figure 1) and the two-sample KS test showed that the two

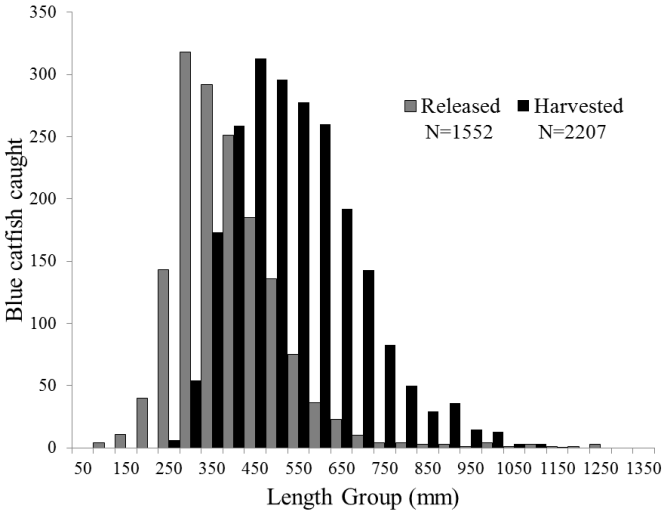

Figure 1. Length frequency histogram for all harvested and released blue catfish caught by volunteer anglers during the volunteer angler creel at Truman Reservoir, 2003–2005.

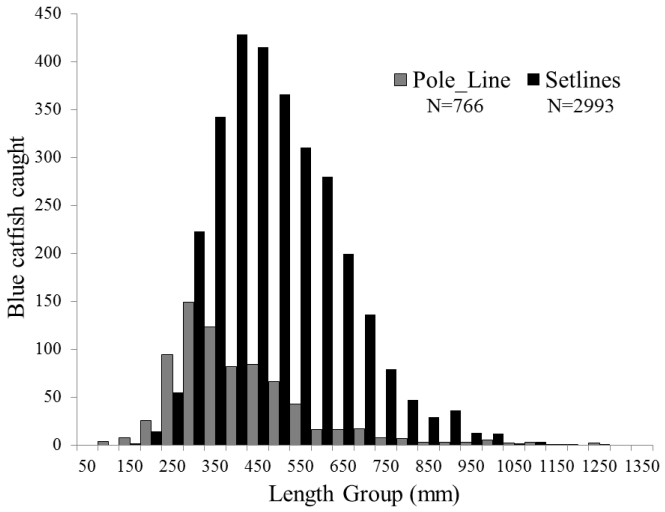

Figure 2. Length frequency histogram for blue catfish caught with pole and line and setlines by volunteer anglers during the volunteer angler creel at Truman Reservoir, 2003–2005.

length distributions were significantly different (D = 0.46, $P < 0.05$). Anglers caught significantly more blue catfish with setlines annually (mean = 998) than with pole and line (mean = 255; $\chi^2 = 266.6$, $P < 0.05$). The length distributions of blue catfish caught with pole and line and with setlines were plotted in a length frequency histogram (Figure 2) and the two-sample KS test showed that the two length distributions were significantly different (D = 0.33, $P < 0.05$).

For all angler trips combined, the overall catch rate for blue catfish was 1.7 fish per angler trip (Table 2), and 79.6% of those were caught with setlines. A total of 404 angler trips targeted blue catfish specifically, and those trips accounted for 1139 blue catfish. Anglers who targeted blue catfish had a higher overall catch rate of 2.7 fish per angler trip when compared to the 1.7 fish per angler trip observed for all anglers combined, but these catch rates were similar ($t = 2.1$; $P = 0.16$).

Anglers caught a total of 397 flathead catfish, of which 76% were harvested (Table 3). Anglers harvested significantly more flathead catfish annually (mean = 101) than they released (mean = 32; $\chi^2 = 12.3$, $P < 0.05$). The mean length for all flathead catfish caught by anglers was 751 mm TL and the estimated mean weight was 5.3 kg based on Missouri standard weight equations. The lengths of flathead catfish harvested (mean = 816 mm TL or 6.8 kg) were significantly larger than those released (mean = 544 mm TL or 2.1 kg; $t = 10.6$, $P < 0.05$). The length distributions of flatheads harvested and released were plotted in a length frequency histogram (Figure 3) and the distributions were significantly different (D = 0.62, $P < 0.05$). Anglers caught significantly more flathead catfish with setlines (344) than with pole and line (53) over all 3 years ($\chi^2 = 14.8$, $P < 0.05$). The length distributions of flathead catfish caught with pole and line and with setlines were plotted in a length frequency

Table 3. Catch and harvest/release data for flathead catfish reported by all anglers during the volunteer catfish angler creel at Truman Reservoir, 2003–2005. Standard errors are shown in parentheses.

	2003	2004	2005	Total	Mean
Total reported by all methods	137	141	119	397	132.3 (6.9)
Mean length (mm) caught	751(21.9)	726(19.1)	781(17.9)	–	751.1 (11.5)[a]
Est. mean weight (kg) caught	5.2	4.7	5.9	–	5.3 (0.3)
Total number harvested	93	106	103	302	100.7 (3.9)
Total number released	44	35	16	95	31.7 (8.3)
Mean length (mm) harvested	861(19.3)	785(18.2)	808(18.0)	–	816.3 (10.8)[a]
Est. mean weight (kg) harvested	8.0	6.0	6.5	–	6.8 (0.6)
Mean length (mm) released	518(34.5)	548(40.9)	606(47.6)	–	543.8 (23.4)[a]
Est. mean weight (kg) released	1.6	2.0	2.6	–	2.1 (0.3)
Catch per angler trip	0.2	0.2	0.2	–	0.2 (0.0)
Total reported by pole/line	23	26	4	53	17.7 (6.9)
Total reported by setlines	114	115	115	344	114.7 (0.3)

a. Mean across all years.

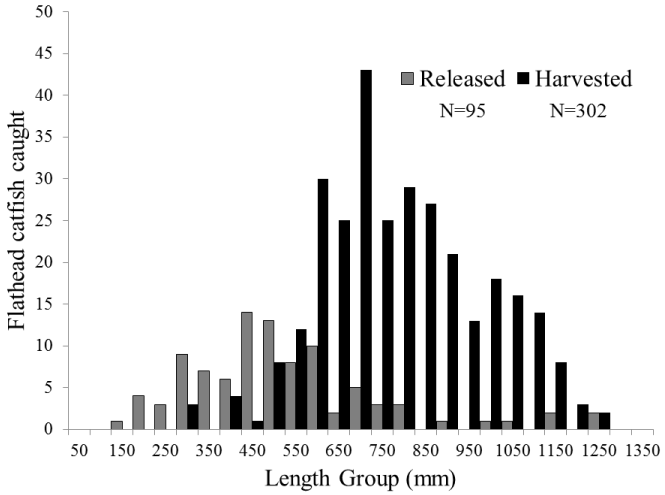

Figure 3. Length frequency histogram for all harvested and released flathead catfish caught by volunteer anglers during the volunteer angler creel at Truman Reservoir, 2003–2005.

histogram (Figure 4) and the two-sample KS test showed that the two length distributions were significantly different ($D = 0.28$, $P < 0.05$).

For all angler trips combined, the overall catch rate for flathead catfish was 0.2 flathead catfish per trip (Table 3), and 86.6% of those were caught with setlines. A total of 299 angler trips (13.4% of all angler trips) targeted flathead catfish specifically, and those trips accounted for 83 flathead catfish. Anglers who targeted flathead catfish had a higher overall catch rate (0.3 fish per angler trip) than all anglers who caught flathead catfish (0.2 fish per angler trip), but these catch rates were similar ($t = 1.73$, $P = 0.22$). Anglers targeting blue catfish had higher overall catches ($t = 8.4$, $P < 0.05$) and higher catch rates ($t = 10.1$, $P < 0.05$) than those targeting flathead catfish.

The percent of volunteer anglers that rated their trip excellent ranged from 11%–19% over 3 yrs, good ratings ranged from 18%–24%, fair ratings ranged from 16%–31% and poor ratings ranged from 34%–47% (Figure 5). Based on the 1055 angler diary forms that were turned in over the 3-yr study, 156 (15%) assigned an excellent rating to their fishing trip (mean = 52/yr, SE = 9.2), 228 (22%) assigned a good rating (mean = 76/yr, SE = 6.0), 239 (23%) assigned a fair rating (mean = 79.7/yr, SE = 14.6), and 432 (41%) assigned a poor rating (mean = 144/yr; SE = 15.1; Figure 6).

Discussion

The lack of effective sampling methods for catfish has been a major challenge for fisheries managers (Michaletz and Dillard 1999). Even though considerable work has been done over the past decade to identify more effective sampling strategies (Kwak et al. 2011, Bodine et al. 2013), fisheries managers still recognize that the lack of effective sampling techniques is a hindrance to managing catfish (Brown 2009). Advances have been made, but until effective catfish sampling techniques are developed, managers still face significant challenges in understanding catfish populations and how to best manage them as important sport fisheries, especially in large reservoirs.

Without effective sampling techniques at our disposal in 2003 to do a thorough evaluation of catfish populations, we needed an alternative method, and angler diaries proved to be a useful tool to track catch rates, sizes of fish caught, and harvest patterns of anglers fishing for catfish in Truman Reservoir. It also provided us an opportunity to assess angler satisfaction with the catfish fishery. Chambers (1993) concluded that the angler diary program was a useful method to collect stock assessment data on an otherwise difficult-to-sample population. We were satisfied with our overall participation rate (45%), and it compared favorably with the 45% participation rate for North Carolina anglers (Chambers 1993), and the 43% participation rate for Texas anglers (Prentice et al.

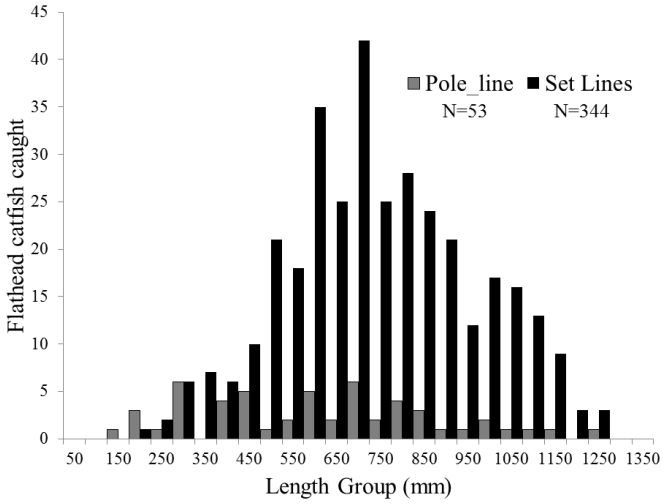

Figure 4. Length frequency histogram for flathead catfish caught with pole and line and setlines by volunteer anglers during the volunteer angler creel at Truman Reservoir, 2003–2005.

Figure 5. Angler trip ratings expressed in percent of total response during the volunteer catfish angler creel at Truman Reservoir, 2003–2005.

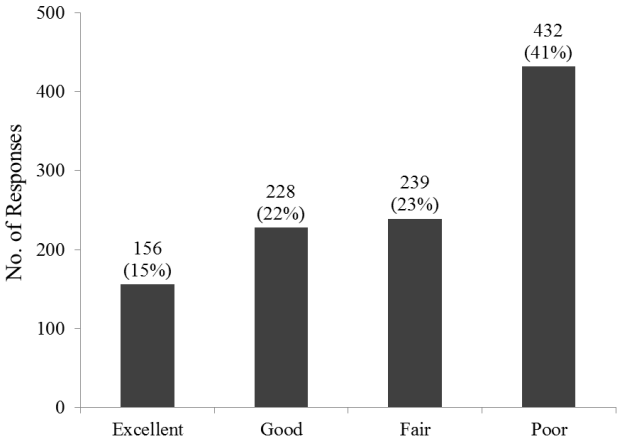

Figure 6. Overall angler trip ratings expressed in the number of ratings in each category and the corresponding percent of the total during the volunteer catfish angler creel at Truman Reservoir, 2003–2005.

1993), but was considerably higher than the 19% participation rate found in Mississippi (Bray and Schramm 2001).

Even though we collected angler creel data on all three catfish species in this study, because of the perception of possible overexploitation in the reservoir, the main focus of this angler survey was on blue catfish and flathead catfish. Anglers targeting blue catfish had higher overall catches and higher catch rates than those targeting flathead catfish. Though the higher overall catches may simply be an indication that blue catfish were more abundant in the reservoir, angler exploitation rates suggest that regardless of their abundance in the reservoir, the available blue catfish are being exploited by anglers at a much higher rate than flathead catfish. In a concurrent exploitation study (Sullivan and Vining 2011), the estimated cumulative exploitation rate after 5-yr post-tagging was 81.7% for blue catfish (≥483 mm TL) but only 8.8% for flathead catfish (≥508 mm TL), nearly a 10-fold difference.

Anglers returning diaries in our study indicated that they harvested 59% of the blue catfish they caught, despite a relatively small mean length (566 mm TL) and weight (1.8 kg) for harvested blue catfish. Utilizing a 9-mo roving creel survey from 1988–1995, Graham and DeiSanti (1999) determined that the mean length of blue catfish harvested in the Truman Dam tailwater was 600 mm TL, and in the Osage River Arm of Lake of the Ozarks just downstream of the tailwater, the mean length harvested was even smaller at 483 mm TL. Holley et al. (2009) found that 85% of channel catfish and blue catfish harvested by anglers in Lake Wilson, Alabama, were between 300 and 600 mm TL, and peak harvest selectivity for blue catfish was about 660 mm TL. They also found that anglers harvested 80% of the catfish they caught. Of all the catfish harvested in their study, 67% were blue catfish, giving evidence that anglers there were also willing to take home many smaller blue catfish, similar to what we observed on Truman and what Graham and DeiSanti (1999) observed at Lake of the Ozarks. For a species that can reach sizes well over 45 kg, the 59% harvest rate we documented in our angler creel study for blue catfish that were less than 2.0 kg seemed very high, but did help to explain the high exploitation rate we documented with our exploitation study.

The angler trip ratings documented in this study were also cause for agency concern as 41% of all angler trips were rated as poor. Even though we didn't follow up with anglers to determine the reasons why they rated their trips a certain way, the results were not surprising, as the agency has received numerous angler comments during the last 15 yrs that the sizes of catfish, and especially blue catfish, have declined.

Because of the consistent differences between blue catfish and flathead catfish catches and the high percentage of anglers who rated their trips as poor in this angler creel, along with the high angler exploitation rate and the continuing input from anglers who have expressed concern over a decline in the numbers of large blue catfish in Truman Reservoir, the MDC recently recommended more restrictive regulations to provide protection for intermediate size blue catfish. If implemented, these proposed regulations would go into effect 1 March 2014 and would include a 660- to 864-mm TL protected slot length limit, 10 blue catfish daily with only 2 blue catfish over 864-mm TL. Immediate changes in management are not being considered for flathead catfish at this time as volunteer anglers reported catching only 397 flathead catfish over 3 yrs, angler exploitation on this species did not appear excessive and subsequent flathead catfish population sampling with low frequency electrofishing indicated a well-balanced population structure.

We were not surprised to see that pole and line anglers accounted for less than 20% of all the blue catfish and flathead catfish caught since MDC conservation agents and fisheries biologists have consistently noted the high volume of jug lines and trot lines present on the reservoir. However, since this volunteer creel survey was completed, interest in catfish angling has been increasing nationwide, and with more boat anglers now equipped with advanced sonar and Global Positioning System technology, more anglers will likely be targeting blue catfish with pole and line. Even though this study showed that a disproportionate percentage of blue catfish (79.6%) and flathead catfish (86.6%) were caught using set line methods when compared to pole and line, no angling method restrictions are being considered at this time. MDC considers daily creel and length limits as the most effective management tools rather than regulating fishing methods.

While aware of the inherent biases and lack of precision associated with conducting a volunteer angler creel survey, this study still allowed us to capture some useful catch and harvest information, and with the use of annual incentive prizes, it was reasonably inexpensive to conduct. In their statewide volunteer angler diary program in Texas during 1986–1988, Prentice et al. (1993) provided inexpensive incentive prizes to garner interest and increase participation, and conducted the angler diary program for about one-third the cost of traditional creel methods.

Angler creel data proved useful for planning future blue catfish management strategies at Truman Reservoir, and similar to the conclusions by Gabelhouse and Willis (1986), our study provided MDC staff the opportunity to more actively engage with Truman Reservoir anglers, which was an obvious benefit. The Truman Reservoir catfish fishery was also highlighted with posters located in bait shops and other local merchants as we recruited volunteers. The volunteers themselves enjoyed the program and several maintained contact with MDC staff well after the volunteer creel survey was completed.

One major consideration before conducting a study of this type is the need to provide adequate and consistent training for volunteers, along with periodic follow up correspondence. Ongoing communication with volunteers throughout the survey is a key component of gathering useful data. We are confident that we provided adequate training prior to each fishing season, and by giving volunteers reason to be confident in their diary entries, we feel certain that our volunteers provided acceptably accurate information.

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Literature Cited

Bodine, K. A., D. E. Shoup, J. Olive, Z. L. Ford, R. Krogman, and T. J. Stubbs. 2013. Catfish sampling techniques: Where we are now and where we should go. Fisheries 38(12):529–546.

Bray, G. S. and H. L. Schramm, Jr. 2001. Evaluation of a statewide volunteer angler diary program for use as a fishery assessment tool. North American Journal of Fisheries Management 21:606–615.

Brown, Z. 2009. Current trends in catfish sampling techniques and information needs. Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies 61:6–9.

Chambers, M. J. 1993. Angler diary survey of flathead catfish in the Yadkin-Pee Dee River System, North Carolina. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:547–551.

Gabelhouse, D. W., Jr., and D. W. Willis. 1986. Biases and utility of angler catch data for assessing size structure and density of largemouth bass. North American Journal of Fisheries Management 6:481–489.

Graham, K. and K. DeiSanti. 1999. The population and fishery of blue catfish and channel catfish in the Harry S. Truman Dam tailwater, Missouri. Pages 361–376 in E. R. Irwin, W. A. Hubert, C. F. Rabeni, H. L. Schramm, Jr., and T. Coon, editors. Catfish 2000: proceedings of the international ictalurid symposium. American Fisheries Society, Symposium 24, Bethesda, Maryland.

Holley, M. P., M. D. Marshall, and M. J. Maceina. 2009. Fishery and population characteristics of blue catfish and channel catfish and potential impacts of minimum length limits on the fishery at Lake Wilson, Alabama. North American Journal of Fisheries Management 29:1183–1194.

Isermann, D. A. and C. P. Paukert. 2010. Regulating harvest. Pages 185–212 *in* W. A. Hubert and M. C. Quist, editors. Inland fisheries management in North America, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Kwak, T. J., M. T. Porath, P. H. Michaletz, and V. H. Travnichek. 2011. Catfish Science: Status and Trends in the 21st Century. Pages 755–780 *in* P. H. Michaletz and V. H. Travnichek, editors. Conservation, ecology, and management of catfish: the second international symposium. American Fisheries Society, Symposium 77, Bethesda, Maryland.

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

Parrett, T. P., J. A. Marshall, and D. J. Bright. 1999. A comparison of daytime and nighttime channel catfish fisheries at two Ohio impoundments. Pages 391–394 *in* E.R. Irwin, W. A. Hubert, C. F. Rabeni, H. L. Schramm, Jr., and T. Coon, editors. Catfish 2000: proceedings of the international ictalurid symposium. American Fisheries Society, Symposium 24, Bethesda, Maryland.

Pollock, K. H., C. M. Jones, and T. L. Brown. 1994. Angler survey methods and their applications in fisheries management. American Fisheries Society, Special Publication 25, Bethesda, Maryland.

Prentice, J. A., B. W. Farquhar, and W. E. Whitworth. 1993. Comparison of volunteer angler-supplied fisheries catch and population structure data with traditional data. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:666–678.

R Development Core Team. 2008. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL *http://www.R-project.org.*

Sullivan, K. P. and I. W. Vining. 2011. Assessing angler exploitation of blue catfish and flathead catfish in a Missouri reservoir using reward tags. Pages 199–207 *in* P. H. Michaletz and V. H. Travnichek, editors. Conservation, ecology, and management of catfish: the second international symposium. American Fisheries Society, Symposium 77, Bethesda, Maryland.

U.S. Army Corps of Engineers. 2012. Kansas City District; District Lakes; Truman Lake. www.nwk.usace.army.mil/Portals/29/docs/lakesites/truman/Truman-LakeMap.pdf (March 2012).

VanDeValk A. J., J. R. Jackson, S. D. Krueger, T. E. Brooking, and L. G. Rudstam. 2007. Influence of party size and trip length on angler catch rates on Oneida Lake, New York. North American Journal of Fisheries Management, 27:127–136.

Weiss-Glanz, L. S. and J. G. Stanley. 1984. Population structure indices of largemouth bass and smallmouth bass determined from angler catches. North American Journal of Fisheries Management 4:89–98.

Willis, D. W. and R. F. Hartmann. 1986. The Kansas black bass tournament monitoring program. Fisheries 11:7–10.

Zar, J. H. 1999. Biostatistical analysis, version 4 edition. Prentice-Hall, Inc. Upper Saddle River, New Jersey.