

Annual Expenditures of Black Bass Tournament and Non-tournament Anglers at O. H. Ivie Reservoir, Texas

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Abstract: We assessed the economic contribution of black bass tournament angling to the total economic value of the black bass (*Micropterus* spp.) fishery from 1 March 2001 to 28 February 2002 at O. H. Ivie Reservoir, Texas, a popular black bass tournament reservoir in rural west Texas. Creel surveys and mail-out questionnaires were used to estimate number of black bass tournaments, black bass tournament and non-tournament angling effort, and direct angling expenditures. An estimated 147 black bass tournaments were held on the reservoir during the study period. Despite the high number of tournaments, we found that tournament angling effort for black bass (27,348 h, RSE = 31) was greatly exceeded by non-tournament angling effort (110,268 h, RSE = 19) and comprised only 20% of total black bass angling effort and 15% of all angling effort expended at the reservoir. Similarly, total estimated angling expenditures were considerably greater for non-tournament anglers (US\$742,430, RSE = 39) than for tournament anglers (\$117,938, RSE = 33). Hence, only 14% of the economic benefit derived from the reservoir's black bass fishery was the result of tournament angling. Implementation of restrictive black bass harvest regulations not conducive to tournament angling (e.g., protective slot limit) would probably have minimal negative effect on angler utilization and the economic benefit derived from O. H. Ivie Reservoir's black bass fishery.

Key words: tournament, non-tournament, black bass, economic, expenditures

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Competitive sport fishing has been growing since inception and black bass (*Micropterus* spp.) tournament angling remains an important component of the recreational fishery in the United States. At least 25,000 competitive fishing events were held in North America during 2000 (Kerr and Kamke 2003). An estimated 5,500 tournaments were held in Texas during 1993 (unpublished data, Texas Parks and Wildlife Department), and at least 14% of Texas freshwater anglers participate in tournaments (Bohnsack and Ditton 1999). Because of increased popularity of black bass tournaments, managers have expressed a need to understand the social, economic, and biological implications of black bass tournament angling. Most research has focused on the biological effects of tournament angling, while fewer studies have investigated the social and economic impacts of tournament angling.

The economic impact of black bass tournament angling in Texas is unknown, although studies of individual tournaments suggest that a considerable portion of the economic value of angling in Texas could be related to black bass tournaments. An experimental tournament held in 1999 on Lake Fork, Texas, produced an estimated economic impact of US\$126,434 (J. W. Schlechte, personal communication). Two tournament events at Sam Rayburn, Texas, held in 2001 and 2002, each produced an estimated economic impact of over \$250,000 (Anderson et al. 2002a). Considering that in 2002 the Sam Rayburn recreational fishery generated an estimated \$7,765,272 in economic impact (Anderson et al. 2002b), it would only require that 31 black bass tournaments each with similar economic impacts of \$250,000 be held on Sam Rayburn for tournament impacts to equal those of the entire rec-

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reational fishery for that reservoir. Black bass tournaments could potentially generate more economic impact than non-tournament angling at some reservoirs.

Economic expenditures resulting from black bass tournaments throughout Texas as well as the level of tournament organization lends to the effectiveness of tournament anglers at influencing the way that public waters of Texas are managed (Schramm et al. 1991). Fisheries management policy must be based on biological objectives; however, managers must also consider the social and economic aspects of policy. Otherwise, the actions of dissatisfied anglers and constituents with direct economic interest could create conflict that would prevent sound biological management. For example, annual biological information collected by Texas Parks and Wildlife Department (TPWD) sometimes indicates that more restrictive regulations (e.g., protective slot and high minimum length limits) could be used to improve the size structure of a largemouth bass (*M. salmoides*) fishery. However, opponents of more restrictive regulations are often associated with tournaments and argue that, if implemented, the frequency of tournaments will decline, thereby reducing overall economic impacts to the local areas adjacent to the fishery in question. These types of issues continue to highlight the need for addressing the questions of how much economic impact tournament angling brings to reservoirs and how that impact compares to that of non-competitive anglers. Answers to these questions could ultimately help managers consider potential economic impacts of more restrictive regulations and help ensure that management preferences of both tournament and non-tournament anglers are appropriately considered.

Few studies have estimated the direct expenditures of black bass tournament anglers and no studies have estimated the direct expenditures related to all tournaments held at a reservoir for a full year. Therefore, our study objectives were to determine the annual direct expenditures of black bass tournament anglers and non-tournament black bass anglers and estimate the annual number of black bass tournaments at O. H. Ivie Reservoir, Texas.

Study Site

O. H. Ivie Reservoir is a 7,700-ha impoundment in a rural area on the Colorado and Concho rivers at their confluence in Coleman, Concho, McCulloch, and Runnels counties. The closest metropolitan areas with populations of $\geq 50,000$ are the cities of San Angelo (88 km), Abilene (113 km), and Midland (289 km). The reservoir opened in 1990 with a 457-mm minimum length limit (MLL) and three-fish daily bag limit (DBL) for black basses and quickly became a popular destination for tournament and non-tournament black bass anglers. During 2001–2002, five largemouth bass >5.9 kg were caught. On 1 September 2001, the regu-

lations on black bass were changed to a five-fish DBL, of which two largemouth bass could be <457 mm, and no more than three fish could be smallmouth bass (*M. dolomieu*).

Public access is restricted to four boat ramps of which two have marinas, motels, gas stations, restaurants, and facilities designed for bass tournament weigh in activities. One of the other two boat ramps is a small isolated ramp that is only usable when the reservoir is near conservation pool. The other ramp was dropped from the creel survey sampling design following the first access point creel survey conducted in 1992 because so few anglers used the ramp and it was decided to concentrate the sampling effort at the two main ramps (TPWD, unpublished creel data).

Methods

Random, stratified, uniform-probability, access-point creel survey sampling was conducted according to Malvestuto (1996) from 1 March 2001 to 28 February 2002 at O. H. Ivie Reservoir. Sampling occurred nine days (five weekend days and four week days) during each three-month quarter with each sampling event lasting six hours. Sample days were randomly selected for each day type strata (week day or weekend day). For each sample day, a single temporal (total N time periods = 2) and spatial sampling unit (total N access points = 2) was chosen randomly using uniform selection probabilities. Angling parties were intercepted at access points after completion of their angling trip and interviewed to determine angling party size, species targeted, time expended angling, and angler type (tournament or non-tournament). Also, the name and mailing address for one angler in each interviewed angling party was collected to facilitate a subsequent mail-out questionnaire. From the access point creel survey sampling data, quarterly estimates of total angling effort and that directed towards black bass by tournament and non-tournament anglers were made following the procedures described by Pollock et al. (1994) and summed to obtain annual estimates.

On O. H. Ivie Reservoir from 1 March 2001 to 28 February 2002, the number of black bass club tournaments was estimated using modified roving creel survey procedures and the number of black bass open tournaments was determined through a census. Club tournaments were defined as those that were restricted to members of a specific organization and open tournaments were defined as those that had unrestricted registration in which any angler could compete. The number of club tournaments occurring on the reservoir was determined for randomly-selected weekend days (one day per weekend from 1 March 2001 to 30 June 2001 and two weekend days per month from 1 July 2001 to 28 February 2002) each month by circuiting the reservoir by boat and interviewing anglers to find out if they were participating in a black

bass tournament (either open or club) and recording the name of the organization responsible for the tournament and contact information for the tournament director or organization president. We then contacted the director or president and obtained a roster with names and addresses for a subsequent mail-out questionnaire. We assumed no tournament events were held on week days or at night based on our 76 tournament contacts, marina operator information, and personal contacts. Circuits of the reservoir were made mid-morning to mid-afternoon each sample day. Following data collection, we post-stratified data into four equal-sized quarters. We based the post-stratification on effort and constrained our strata to include adjacent months with relatively consistent effort. The quarterly average number of club tournaments per weekend day was multiplied by the number of weekend days per quarter to estimate the total number of club tournaments per quarter. The quarterly estimates were then summed to obtain an annual estimate of the total number of club tournaments occurring on the reservoir. We used accepted post-stratification equations (Cochran 1977) to compute the estimated sampling variance of the total number of tournaments.

The annual number of open tournaments was determined from information provided by anglers interviewed during creel sampling and searching the internet, newspapers, and fishing magazines for references to tournaments at the reservoir. Also, posters and sign-up sheets were placed at marinas and at a popular restaurant near the reservoir for anglers fishing tournaments at the reservoir to provide information about the tournament they were participating in and for contact information for that tournament. Because of the advertised and publicized nature of the open tournaments, we believe this was a census of the open tournaments.

Self-administered questionnaires were mailed to 1,982 black bass tournament anglers and 338 non-tournament black bass anglers to obtain economic expenditure information related to their last angling trip to O. H. Ivie Reservoir. Questionnaire mailings were conducted quarterly, and instructions for completion and a postage-paid return envelope accompanied each questionnaire. Individuals who did not respond within 12 days were sent a reminder letter expressing the importance of returning a completed questionnaire. Anglers were asked to indicate their group's expenditures in each of 13 expense categories within and outside a local four-county area (Table 1). The local four-county area included Concho, Runnels, Coleman, and McCulloch counties, which surround the reservoir. A group was defined as those people traveling together in the same vehicle and could consist of angling partner(s), family member(s), and other companion(s). Anglers were also questioned regarding angler type (tournament or non-tournament), the duration (in days) of their last angling trip, and

Table 1. Descriptions of expenditure categories from economic surveys sent to tournament and non-tournament black bass anglers at O. H. Ivie Reservoir, Texas, 1 March 2001 to 28 February 2002.

Category	Description
Automobile	Fuel, rental cars, repairs, etc.
Other transportation	Airplane, etc
Boat rental fees	Boat rental fees
Boat operation	Fuel, oil, service, etc.
Boat launch fees	Boat launch fees
Parking	Entrance or parking fees
Lodging	Hotel, camping site, resort rental, etc.
Restaurant meals	Restaurant meals
Groceries	Food, drinks, ice, etc.
Bait/Tackle	Bait and tackle purchased during this trip
Guide ^a	Fishing guide fees
License ^a	Fishing license fees
Other	Other expenses

a. Not asked on the tournament angler survey

the number of individuals in their group. Returned questionnaires that were not entirely completed were not used in data analysis. A test for non-response bias was not conducted and it was assumed that respondents were representative of O. H. Ivie Reservoir black bass anglers. Survey responses from open and club tournament anglers were pooled for expenditure analysis due to sample size constraints.

Total annual economic expenditures by angler type (tournament and non-tournament), area (inside and outside four-county area), and expense category were estimated using angling effort and mean angling trip time estimates derived from the access-point creel sampling and expenditure data from completed questionnaires. For each questionnaire respondent, separate hourly expenditure rates (ER) were calculated for the four-county and outside areas by:

$$ER = EXP / DAYS / GS / TPL,$$

where EXP = total expenditures inside or outside four-county area, DAYS = duration of the trip, GS = number of individuals in the group, and TPL = tournament or non-tournament mean angling trip length (in h).

Mean angling trip length for tournament and non-tournament anglers was estimated by averaging individual party trip lengths. Because angling party size differed among interviewed parties, angling party size was used as weighting factor in computing TPL estimates. An independent sample *t*-test was used to test if mean angling trip length differed ($P \leq 0.05$) between tournament and non-tournament anglers (SAS 2005). Individual questionnaire respondent hourly ER were averaged to estimate a mean hourly expenditure rate (MR) by angler type, separately for inside and out-

side the four-county area. Because group size differed among questionnaire respondents, angling group size was used as a weighting factor in computing MRs. Independent- or paired-sample *t*-tests were used to determine significant differences ($P \leq 0.05$) between MRs among angler type and area (SAS 2005).

Tournament and non-tournament angling hour estimates were multiplied by the respective MR to estimate total annual angling expenditures by angler type and area. Variance for total annual angling expenditure estimates was calculated as variance of a product according to Cochran (1977). Standard error (SE) and RSE (SE/mean * 100) were obtained for each total annual expenditure estimate using its respective variance.

Total annual expenditure by expense category was estimated by angler type and separate for inside and outside the four-county area. These were derived by computing the proportion of the expenditures reported by questionnaire respondents represented in each expense category and multiplying by estimated total annual expenditures. Variance, SE, and RSE for the total annual expenditure by expense category estimates were calculated according to Cochran (1977) as described above.

Results

Non-tournament black bass anglers comprised the majority of the O. H. Ivie Reservoir recreational fishery. An estimated 182,391 (RSE = 16.9) angling hours were expended by all anglers, with 75% of that effort directed toward black bass (137,617 h; RSE=19.5). Non-tournament angling represented 80% of the total black bass angling effort and accounted for 60% of the total angling activity on the reservoir (110,268 h; RSE = 19.3). Tournament angling represented 20% of the total black bass fishing effort (27,348 h; RSE = 30.9). Conversely, mean trip length was significantly greater (*t*-test, $P < 0.0001$) for tournament anglers (7.87 h, RSE = 2.1) than non-tournament anglers (5.51 h, RSE = 2.0). Nonetheless, effort of tournament black bass anglers comprised only 20% of total black bass angling effort and 15% of all angling effort on the reservoir.

Black bass club tournaments were more frequent than black bass open tournaments. During the study, 11 open tournaments and an estimated 136 club tournaments (SE = 54.7) occurred at the reservoir. Rosters were acquired from nine of the 11 open tournaments and from 45 of the 76 observed club tournaments. The number of reported participants in open tournaments ranged from 99 to 1,051 anglers, whereas the number of participants in club tournaments ranged from 3 to 47.

Of the 2,320 questionnaires mailed to black bass anglers, 474 (20%) were returned as non-deliverable and 857 (37%) were completed and returned. The effective response rate of tournament black bass anglers was 47% (728 of 1,561 questionnaires) and of

non-tournament black bass anglers was 45% (129 of 285 questionnaires). Comments on some of the returned questionnaires and those made to TPWD staff when speaking to black bass tournament participants indicate that many tournament anglers received more than one questionnaire at the same time. Because of our quarterly mail-out procedures, anglers who participated in several tournaments during a three-month period received multiple questionnaires (one for each tournament they fished). Some respondents indicated they only completed one or two surveys, then disposed of the rest which would account for some of the non-responses.

Mean hourly expenditure rates for O. H. Ivie tournament anglers were \$2.75/h (RSE=5.5) inside and \$1.56/h (RSE=31.9) outside the four-county area and for non-tournament anglers were \$3.99/h (RSE=12.2) inside and \$2.74/h (RSE=60.8) outside the four-county area. Mean hourly expenditure rates were similar inside and outside the four-county area within angler type; however, non-tournament angler MR exceeded tournament angler MR inside the four-county area. Non-tournament MR did not differ (paired *t*-test, $t = 0.26$, $P = 0.795$) between inside and outside the four-county area. Similarly, tournament MR did not differ (paired *t*-test, $t = 1.46$, $P = 0.144$) between inside and outside the four-county area. Non-tournament angler MR was significantly greater (*t*-test, $t = 2.01$, $P = 0.044$) than tournament angler MR inside the four-county area; however, outside the four-county area MR did not differ (*t*-test, $t = 0.75$, $P = 0.452$) between angler types. Expenditure rate varied more among anglers outside the four-county area than inside; RSEs for outside the four-county area MR estimates were greater than RSEs for inside.

Total expenditures were greater for non-tournament anglers than for tournament anglers and greater inside the four-county area than outside for both black bass angler types (Table 2). Total estimated annual expenditures for all black bass anglers were \$860,368 with non-tournament anglers accounting for 86%. Total estimated expenditures by tournament anglers inside the four-county area (\$75,172) represented only 9%. The proportion of total expenditures that were inside the four-county area was similar between non-tournament (59%) and tournament anglers (64%). Expenses for automobile operation, boat operation, lodging, and

Table 2. Total estimated expenditures (US\$) of tournament and non-tournament black bass anglers (relative standard error = RSE), inside and outside the four-county area surrounding O. H. Ivie Reservoir, Texas, 1 March 2001 to 28 February 2002.

Location	Tournament	RSE	Non-tournament	RSE	Total	RSE
Inside	75,172	29.3	440,218	22.3	515,389	23.3
Outside	42,766	39.7	302,212	63.4	344,979	60.4
Total	117,938	33.1	742,430	39.0	860,368	38.2

food (restaurant meals and groceries) accounted for >75% of total fishing-related expenditures for both non-tournament and tournament anglers (Table 3). Lodging was the predominant fishing-related expenditure inside the four-county area, whereas automobile operation was outside.

Discussion

O. H. Ivie was a very popular site for black bass tournaments and received considerable tournament angling pressure. Eleven open and an estimated 136 club tournaments occurred at the reservoir during the study period, an average of 2.8 tournaments per weekend. Actual number of O. H. Ivie Reservoir club and open tournament anglers was not estimated. Because open tournaments generally had more participants, the proportional difference in angling hours between club and open tournament anglers is likely different than the proportion of club to open tournament events. Tournament angling pressure at O. H. Ivie Reservoir was similar to that at Sam Rayburn Reservoir (45,092 ha), one of the most popular tournament sites in Texas. Black bass tournament angling effort was 3.6 hours/ha at O. H. Ivie Reservoir compared to 3.3 hours/ha at Sam Rayburn Reservoir in 2002 (TPWD, unpublished creel data).

Despite the fact that O. H. Ivie Reservoir is one of Texas’s most popular black bass tournament locations, tournament black bass angling was not the predominant component of the recreational fishery. Black bass tournament angling effort comprised only 15% of the total angling effort and 20% of black bass angling effort. Anglers and managers may incorrectly perceive that the black bass tournament component of a fishery is greater than it really is be-

cause many tournament events and associated weigh-ins are publicized, tournaments occur mostly on weekend days when overall angling activity is greatest, and tournament anglers are generally more visible due to their organization and equipment than non-tournament anglers.

Black bass tournaments can have large economic impacts (Anderson et. al. 2002a). Thus, at sites where black bass tournaments are frequent, expenditures of tournament anglers could account for a considerable portion of all angling-related expenditures. However, at O. H. Ivie Reservoir, total expenditures of tournament anglers represented only 14% of total black bass angler expenditures. The difference in total estimated angling expenditures between tournament and non-tournament anglers was due primarily to the disparity between tournament and non-tournament angling effort. While expenditure rates were similar between tournament and non-tournament anglers, non-tournament angling effort was four times greater than tournament angling effort on the reservoir.

The ratio of tournament to non-tournament black bass angler expenditures probably varies among reservoirs and may be a function of tournament type and reservoir location. The vast majority of O. H. Ivie Reservoir tournaments were club events (93%) which typically have few participants (<50). Open tournaments, especially those associated with black bass tournament circuits (e.g., Bass Angler Sportsman’s Society and Skeeter Bass Champs Tournament Trail) typically attract many more participants, resulting in greater tournament angler expenditures. Thus, economic contribution from tournament anglers could be greater at reservoirs where large open tournaments are commonly held compared to

Table 3. Percent of estimated total expenditures and total estimated expenditures (US\$) with relative standard errors (RSE) by expense categories for tournament and non-tournament black bass anglers inside and outside the four-county area surrounding O. H. Ivie Reservoir, Texas, 1 March 2001 to 28 February 2002.

Expense category	Inside four-county area						Outside four-county area					
	Tournament			Non-tournament			Tournament			Non-tournament		
	Percent	Expenditures	RSE	Percent	Expenditures	RSE	Percent	Expenditures	RSE	Percent	Expenditures	RSE
Automobile	19.2	14,410	30.2	16.0	70,455	30.2	33.9	14,477	40.0	31.6	61,286	64.2
Other transportation	0.1	63	127.3	0.1	326	328.8	0.1	24	149.0	0.0	0	–
Boat rental fees	0.4	327	61.5	0.3	1,149	176.1	0.2	103	80.5	0.1	911	188.0
Boat operation	14.2	10,709	30.6	10.0	43,866	34.9	16.4	7,011	40.5	12.7	25,252	66.0
Boat launch fees	2.6	1,953	36.6	2.6	11,440	59.1	2.4	1,018	45.4	0.9	2,755	96.3
Parking	2.0	1,506	38.5	2.5	10,996	60.1	0.7	303	56.8	0.7	2,384	102.5
Lodging	24.0	18,047	30.0	21.9	96,561	27.9	14.1	6,042	40.6	11.2	22,533	66.4
Restaurant meals	15.1	11,378	30.5	16.4	72,114	30.1	9.6	4,108	41.1	8.6	17,520	67.4
Groceries	9.7	7,263	31.3	12.8	56,168	32.3	9.3	4,010	41.1	11.9	23,877	66.2
Bait/Tackle	7.3	5,505	31.9	5.3	23,363	43.8	10.7	4,580	41.0	5.9	12,438	69.4
Guide ^a	–	–	–	6.1	26,863	41.5	–	–	–	0.0	0	–
License ^a	–	–	–	3.8	16,585	50.4	–	–	–	4.8	10,198	70.8
Other	5.3	4,009	32.9	2.3	10,330	61.8	2.5	1,089	45.1	11.4	22,915	66.4

a. Tournament anglers were not asked about this category

O. H. Ivie Reservoir where club events predominate. Reservoir location and proximity to metropolitan areas also could affect the ratio of tournament to non-tournament black bass angling expenditures. Lodging is presumably more frequently necessary for tournament anglers than non-tournament anglers because many tournaments are multiple-day events, tournament anglers sometimes arrive prior to competition to practice, and tournament anglers may travel further distances than non-tournament anglers; non-tournament anglers may fish closer to home. Lodging (inside four-county area) and automobile (outside four-county area) were the primary expenses for O. H. Ivie Reservoir tournament anglers. However, for non-tournament anglers, they were also the primary expenses, suggesting they traveled similar distances and proportionally made a similar number of multiple-day angling trips to the reservoir as tournament anglers. This may indicate that O. H. Ivie Reservoir is a destination that attracts non-tournament anglers from distances too great to facilitate a one-day commute to and from the reservoir. The economic impact from tournament anglers may be greater for popular tournament reservoirs located near large metropolitan areas.

Potential economic and social impacts on the angling population as well as biological effects on the black bass population are usually considered before changing black bass harvest regulations. As noted earlier, during our study the black bass harvest regulations at O. H. Ivie Reservoir changed from a 457-mm MLL and three-fish DBL to a five-fish DBL, of which two largemouth bass could be <457 mm, and no more than three fish could be smallmouth bass. This change likely had no negative effect on tournament angling activity at O. H. Reservoir because the new harvest regulations were less restrictive. Under the new regulations, tournament anglers could retain more and smaller fish. This study was not designed to evaluate effect of the recent black bass harvest regulation changes on tournament angling, but rather to assess the economic contribution of tournament angling to the total economic value of O. H. Ivie Reservoir's black bass fishery. Our study revealed for O. H. Ivie Reservoir that the vast majority of black bass angling effort was from non-tournament anglers, tournament anglers had proportionally less angling expenditures, and only 14% of the economic benefit derived from the reservoir's black bass

fishery was the result of tournament angling. While no further regulation changes are planned at O. H. Ivie Reservoir at this time, implementation of a harvest regulation less conducive to tournament angling (e.g., protective slot limit) would probably have only a minimal negative effect on angler utilization and the economic benefit derived from O. H. Ivie Reservoir's black bass fishery. If a change to more restrictive harvest regulations decreased tournament angling activity and was successful in improving the quality of the black bass fishery, the potential economic loss (from tournaments) could be mitigated by increased non-tournament angling.

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