Characteristics of Urban Anglers in Lubbock, Texas

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Abstract: Angler surveys were conducted at 18 lakes in municipal parks during June–December 1987. Anglers <16 years old were the largest proportion of the participants. Of the anglers surveyed, 93% were residents of Lubbock. They averaged 6.9 fishing trips per month and fishing frequency differed among age groups and between summer and fall. Resident anglers travelled an average of 4.7 km to fish; distance travelled differed among age groups and between summer and fall. Anglers preferred to catch catfish (*Ictalurus* spp., 79% of anglers) and largemouth bass (*Micropterus salmoides*, 72%). Fishes most frequently fished for were catfish (31% of anglers), largemouth bass (11%), and sunfish (*Lepomis* spp., 10%; 49% of the anglers indicated they were fishing for "any fish." Exclusive of travel expenses, anglers spent an average of $5.78 per day to fish in Lubbock's lakes. Fifty-six percent of anglers had knowledge of fishing regulations.

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The population of recreational fishermen continues to grow and the U.S population continues to shift from rural to urban residents. Wise development and management of fishery resources in urban environments can provide fishing opportunities for the increasing number of urbanized anglers.

Development and management of fishery resources should consider the characteristics of the angler populations that use and benefit from the fishery resource (Duttweiler 1976). Lubbock, Texas, although located in a semi-arid region relatively devoid of public fishing waters, has 18 lakes located in municipal parks. To provide information useful for developing the most satisfactory fishing opportunities for the users of this resource, we conducted at-lake angler interviews to measure demographic parameters and angler use, expenditures, preferences, and awareness of fishing regulations.

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Methods

Lubbock, Texas, has a population of 190,000 and covers a surface area of 269 km^2. Eighteen lakes ranging from 0.8–33.0 ha (mean = 5.3) are in municipal parks located throughout the city. Fish communities include goldfish (*Carassius auratus*), carp (*Cyprinus carpio*), blue catfish (*Ictalurus furcatus*), black bullhead (*I. melas*), channel catfish (*I. punctatus*), green sunfish (*Lepomis cyanellus*), bluegill (*L. macrochirus*), largemouth bass (*Micropterus salmoides*), and white crappie (*Pomoxis annularis*). Most lakes have moderate to high densities of goldfish and small black bullhead and green sunfish. Hybrid striped bass (*Morone saxatiles* × *M. chrysops*) fry were stocked in 3 lakes in 1987.

Anglers were surveyed on the banks at all lakes during 20 June to 31 December 1987 to determine characteristics of the angler population fishing in the Lubbock lakes. The few anglers fishing from boats came to the shoreline to be interviewed. During 20 June through 6 November 1987, 8 surveys were conducted during each 2-week calendar period. Weekends and weekdays were assigned equal sampling probabilities (Saturday and Sunday, $P = 0.25$ each, weekdays, $P = 0.1$ each). Each day (sunrise to sunset) was divided into 3 equal-length time periods and assigned probabilities to reflect observed angler use. Night fishing was <1% of total fishing effort (Rusty Black, Lubbock Parks and Recreation Dep., pers. commun.). The 18 lakes were divided into 3 groups and each group assigned equal probabilities to allow equal sampling of anglers at all lakes. Dates, time periods, and lake groups were randomly chosen for each 2-week calendar period. After October, fishing effort declined and most fishing occurred on weekends. During 7 November through 31 December 1987, creel surveys were conducted only on weekends; 4 time periods were sampled during each 2-week calendar period. Creel periods were selected the same as during 20 June through 6 November except probabilities for day of the week were 0.5 for both Saturday and Sunday.

Questions addressed demographics, resource use, expenditures for fishing, preferences of sportfish, and awareness of fishing regulations. Anglers were asked their age, city of residence, and 1-way distance travelled to fish. Their race and sex were recorded. Fishing frequency was determined by asking "how many times in the past 30 days did you fish in any of the lakes in Lubbock," and "how many times in the past 30 days did you fish in lakes outside of Lubbock." Fishing expenditures were estimated by asking "exclusive of travel, how much have you spent to fish in the Lubbock lakes during the past 30 days—include bait, tackle, licenses, refreshments, etc." Angler preferences for sportfishes were determined by asking anglers "what fish are you fishing for (fishes sought—we allowed up to 3 responses per angler)" and "what 2 fish would you most like to catch (fishes preferred)." For analyses of species sought and species preferred, anglers specifying a species of catfish

or bullhead were pooled with anglers that responded "catfish" and the species group was named catfishes (*Ictalurus* spp.). Similarly, anglers specifying a species of sunfish were pooled with anglers that responded "sunfish" and the species group was named sunfishes (*Lepomis* spp.). Awareness of fishing regulations was determined by "give me an example of a fishing regulation" and "tell me the current largemouth bass size or daily bag limits". All angler interviews were conducted to complete the survey as thoroughly as possible.

Survey responses were analyzed by analysis of variance and Chi-square as appropriate. For statistical analysis, temporal comparisons were performed for "summer" (June–August) and "fall" (September–December) and angler age comparisons were performed for age groups chosen to parallel national survey statistics (U.S. Dep. Int., Fish and Wildl. Serv., and U.S. Dep. Commerce, Bur. Census 1982) and to allow comparisons among young anglers unable to drive vehicles (<16 years old), young anglers able to drive vehicles (16–24 years old), middle-aged anglers (25–44 and 45–59 years old), and senior citizens (>60 years old).

Results

We interviewed 1,238 anglers fishing in the Lubbock lakes (hereafter, the angler population) during 20 June through 31 December 1987. Male and female anglers were 80% and 20% of the angler population, respectively, and sex ratios did not differ among age groups ($P = 0.41$). Racial composition of the anglers was 64% white, 21% Hispanic, 14% black, and 1% other. Age composition of the angler population differed between summer and fall ($P < 0.001$). Anglers <16, 16–24, 25–44, 45–59, and ≥60 years old were 44%, 9%, 29%, 11%, and 7%, respectively, of the angler population in the summer and 33%, 14%, 29%, 11%, and 13%, respectively, of the angler population in the fall.

All anglers fished an average of 7.9 days per month in any water and 6.6 days per month in the lakes in Lubbock. Of all anglers, 98% lived in Lubbock County and 93% lived within the city limits of Lubbock. Lubbock city anglers fished an average of 6.9 days per month in Lubbock lakes and fishing days per month differed among age groups ($P = 0.005$) and between summer and fall ($P = 0.0001$) (Table 1). Anglers <16 and 45–59 years old fished more frequently than other age groups in both summer and fall seasons.

Average 1-way distance travelled to fish by all anglers was 13.8 km (SE = 2.9, $N = 1{,}157$) and was not different among age groups ($P = 0.88$). Lubbock residents travelled an average of 4.7 km to fish in the lake at which they were interviewed, and distance travelled to fish differed among age groups ($P = 0.0001$) and between summer and fall ($P = 0.0042$). Lubbock residents <16, 16–24, 25–44, 45–59, and ≥60 years old travelled 4.3, 4.3, 5.5, 7.1, and 5.2 km, respectively, in the summer, and 3.5, 3.9, 4.3, 5.8, and 4.3 km, respectively, in the fall.

Anglers preferred to catch catfish, largemouth bass, crappie, and carp (Table 2). There were no differences in preferred fishes among age groups ($P = 0.99$).

Fishes most commonly sought by all anglers were catfish, largemouth bass,

Table 1. Average days per month by anglers fishing in the Lubbock lakes during summer (June–August) and fall (September–December) 1987. Values in parentheses are SE, *N*.

Season	Age (years)					All anglers
	<16	16–24	25–44	45–59	≥60	
Summer	11.3 (1.4, 62)	9.1 (1.9, 28)	6.1 (0.6, 116)	8.4 (1.3, 50)	8.0 (1.5, 36)	8.1 (0.5, 292)
Fall	6.1 (1.1, 45)	3.7 (0.6, 37)	4.9 (0.6, 106)	7.5 (1.2, 49)	6.0 (0.8, 54)	5.6 (0.4, 291)
Jun–Dec	9.1 (1.0, 107)	6.0 (1.0, 65)	5.5 (0.4, 222)	8.0 (0.9, 99)	6.8 (0.8, 90)	6.9 (0.3, 583)

sunfish, and carp (Table 2). Anglers stated "any fish" in 49.5% of the interviews. Other fishes sought by low percentages of the anglers included goldfish, crappie (*Pomoxis* spp.), and hybrid striped bass. Species sought by anglers differed among age groups ($P < 0.0001$), but "any fish" and catfish were the most frequently sought fish by all age groups (Table 2).

The average expenditure per angler per day was $5.78. Expenditure per day differed among age groups ($P = 0.014$) and between summer and fall ($P = 0.011$) (Table 3).

Among all anglers, 56% were able to state a fishing regulation and 41% cor-

Table 2. Percentage of anglers using Lubbock lakes fishing for different fishes (fish sought) and preferring to catch or fish for different fishes (fish preferred). Totals for fish sought and fish preferred exceed 100% because anglers were allowed up to 3 responses for fish sought and 2 responses for fish preferred.

Type of fish	Age (years)					All ages
	<16	16–24	25–44	45–59	≥60	
			Fish sought			
Carp	8.2	17.9	13.0	6.7	5.4	7.7
Catfish	32.6	48.7	47.6	54.8	33.7	31.3
Sunfish	10.5	12.8	16.9	6.7	20.7	10.2
Largemouth bass	7.4	29.5	22.9	16.3	9.8	11.2
Other	5.8	5.0	5.3	5.1	4.1	5.0
Any fish	52.7	73.1	74.0	54.8	68.5	49.5
N anglers	476	134	361	136	122	1,229
			Fish preferred			
Carp	13.2	3.8	4.8	1.9	4.3	10.1
Catfish	91.2	78.2	74.5	83.7	79.3	79.1
Sunfish	15.4	5.1	12.6	4.8	9.8	5.3
Largemouth bass	69.2	79.5	74.9	76.0	63.0	72.0
Crappies	12.1	10.3	14.7	19.2	19.6	15.1
Other	10.1	14.1	11.7	6.7	14.1	10.9
N anglers	99	78	231	104	92	604

Table 3. Average dollar expenditure per day by anglers fishing in the Lubbock lakes during summer (June–August) and fall (September–December) 1987. Values in parentheses are SE, *N*.

Season	Age (years)					All ages
	<16	16–24	25–44	45–59	≥60	
Summer	2.51 (0.71, 56)	6.38 (2.06, 34)	9.77 (1.77, 121)	9.24 (2.47, 46)	3.51 (1.03, 36)	7.20 (0.69, 303)
Fall	1.59 (0.52, 41)	7.07 (3.13, 37)	4.72 (1.04, 110)	3.76 (1.26, 45)	3.80 (1.71, 51)	4.26 (0.91, 284)
Jun-Dec	2.12 (0.46, 97)	6.74 (1.89, 71)	7.36 (1.06, 231)	6.80 (1.55, 101)	3.68 (1.08, 87)	5.78 (0.58, 587)

rectly stated the current largemouth bass size or daily bag regulations (Table 4). Awareness of fishing regulations differed among age groups ($P < 0.0001$). Anglers <16 years old were the least knowledgeable of fishing regulations. Anglers fishing for or preferring to fish for largemouth bass were 72% of the anglers. Of these anglers, 44% correctly stated the largemouth bass regulations. Awareness of regulations differed between anglers fishing for or preferring to fish for largemouth bass and anglers not fishing for or preferring to fish for largemouth bass ($P < 0.0001$).

Discussion

People <16 years old were the greatest proportion of anglers fishing in the Lubbock lakes during June to December 1987. People <16 years old were 16% of the Lubbock County population (Texas Dep. Health, Population Data System, Austin). Angling participation by people <16 years old was greater than expected from the age structure of the Lubbock County population. Conversely, male anglers 16–24 years old and female anglers 16–24 and ≥60 years old were lower proportions of angler participation than expected from the Lubbock County population. The decrease in fishing participation by these age and sex groups parallels trends in angler participation nation-wide (U.S. Dep. Int., Fish and Wildl. Serv. and U.S. Dep. Commerce, Bur. Census 1982).

Female anglers were a lower proportion of the Lubbock lake angler population than the national average of 31% (U.S. Dep. Int., Fish and Wildl. Serv. and U.S. Dept. Commerce, Bur. Census 1982). The racial composition of the angling population closely parallels that of the Lubbock population of 69.2% white, 21.8% Hispanic, and 8.9% black (David Buckberry, City Planning Dep., Lubbock, Texas, pers. commun.).

Anglers fishing in the Lubbock lakes fished more frequently than the national average for freshwater fishing of 19 fishing days per angler per year (U.S. Dep. Int., Fish and Wildl. Serv. and U.S. Dep. Commerce, Bur. Census 1982). Although the anglers fished frequently in the Lubbock lakes, they averaged only 1.3 fishing days per month to other waters. Anglers <16 years old fished most frequently, followed

Table 4. Percentage of anglers fishing in the Lubbock lakes that correctly stated any fishing regulation or the current largemouth bass size or daily bag limit. Bass anglers are anglers fishing for or preferring to catch largemouth bass.

Knowledge of regulation	Age (years)					Bass anglers (N = 416)	All anglers (N = 577)
	<16 (N = 92)	16–24 (N = 73)	25–44 (N = 226)	44–59 (N = 101)	≥60 (N = 85)		
Stated a fishing regulation but could not state largemouth bass regulations	18.5%	30.1%	13.7%	11.9%	9.4%	18.5%	15.6%
Stated largemouth bass regulations	14.1	28.7	45.2	60.4	43.5	44.2	40.6
Stated neither a fishing nor a largemouth bass regulation	67.4	41.1	41.1	27.7	47.1	37.3	43.9

by anglers 44–59 years old. Anglers fished more frequently in the summer than in the fall. This decline was greatest for anglers <16 and 16–24 years old. Activities by these age groups can be influenced by school summer vacations. Fishing frequency only slightly declined between summer and fall for anglers 44–59 years old.

Distance travelled was lowest among anglers ≤24 and ≥60 years of age. Although anglers 16–24 are capable of independent travel by vehicle, the average distance travelled to fish was the same as for anglers <16 years old. Anglers 25–59 were the most mobile. The distances travelled by all age groups, although significantly different among age groups, were relatively short distances. We suggest the numerous lakes located throughout the city was conducive to the high frequency of fishing by Lubbock residents.

Lubbock lake anglers preferred to catch catfishes, largemouth bass, crappies, and carp. Although not all angler preferences can be accomplished with equal success, such as management for crappies in small waters or management for largemouth bass in intensively-fished ponds without harvest regulations, the preferences of the anglers provide guidance for fisheries management in Lubbock's lakes. To satisfy the diverse preferences of the anglers, it may be necessary to manage different lakes for different fisheries.

Fishery management programs must include evaluation of the success of a management activity. Angler satisfaction is often used as a measure of program success. Angler satisfaction can be affected by angler's preference for fish species. The species of fish caught was the most frequently-cited determinant of memorable fishing trips by Missouri anglers (Weithman and Anderson 1978). Fedler (1984) concluded catching the kinds of fish desired was important to the overall satisfaction of marine charter boat anglers. *A priori* measurements of angler preferences are important for the interpretation of angler satisfaction as a measure of success of a fishery management program.

Although catching preferred fishes is an important component of angler satisfaction, the lower percentages of anglers fishing for catfish and largemouth bass than the percentages of anglers preferring these species suggests that other factors are involved. A long list of psycho-social factors contribute to why anglers fish (e.g., Driver and Cooksey 1977, Ditton and Fedler 1984, Fedler 1984); of these factors, catching fish is recognized to be important (Stroud 1977, Hicks et al. 1983) and can be affected by the fishery manager. For the anglers fishing the Lubbock lakes, the higher percentage of anglers fishing for sunfish than the percentage of anglers preferring sunfish, and the high percentage of anglers fishing for "any fish" supports the importance of catching fish. The Lubbock lakes contained abundant populations of goldfish, black bullhead and sunfishes. The black bullhead and sunfish populations had few quality-size fish. These fish were, however, readily caught. Although many anglers were fishing to catch fish to eat and kept those fish large enough to be eaten, the food quality of the fish (size and species) caught by anglers fishing to catch sunfish or "any fish" suggests the anglers should not necessarily be considered consumption-oriented. In addition to fish species preferences of the anglers and perceived quality of sizes and species of fish as sport and food fish, the

catchability of the fish should be considered in establishing the fishery management goals for an urban fishery.

The average dollar expenditure per day for anglers fishing the Lubbock lakes appears to be approximately half the national average of $11.28 per day for non-Great Lakes freshwater anglers (U.S. Dep. Int., Fish and Wildl. Serv. and U.S. Dep. Commerce, Bur. Census 1982). The expenditure by Lubbock lake anglers did not include transportation costs and lodging costs were assumed to be zero. Deleting transportation and lodging costs (36% of total cost), the national average cost per fishing day for freshwater fishermen was $7.22. The overall average expenditure per day for Lubbock lake anglers was, therefore, approximately $1.44 less than the national average. Furthermore, the national average of $11 per day does not include anglers <16 years old. In our survey, anglers <16 years old had the lowest per trip expenditure and were a large portion of the angler population. In final analysis, per-day expenditures exclusive of transportation and lodging by Lubbock lakes anglers were similar to the national average for non-Great Lakes freshwater anglers.

Based on only 56% of all anglers able to state any fishing regulation and 44% of anglers fishing for or preferring to fish for bass able to state a largemouth bass regulation, the anglers had a poor knowledge of regulations. Angling regulations are available to anglers in a concise "Texas Freshwater Fishing Guide" published by Texas Parks and Wildlife Department. The anglers were asked specifically to state the current largemouth bass regulations, rather than the regulations for any other sport species, because the largemouth bass size limits increased and daily bag limits decreased in September 1986. This change in regulation was preceded and anteceded by considerable exposure in newspapers and outdoor magazines. The poor knowledge about angling regulations and the inability to effectively communicate fishing regulations to the angler populations must be considered in any attempt to manage intensively-fished urban waters with harvest regulations. It should be noted that young anglers, the largest proportion of the angling population, were the least knowledgeable of fishing regulations. As suggested by Ditton (1977) and Johnson (1984), management of the users may be the most important, difficult, and challenging component of urban fisheries management.

Successful fishery management must consider the diversity among fishermen (Ditton and Fedler 1984). From this study, specific categories of angler diversity include not only the obvious category of sport fish preference, but also spatial and temporal use patterns, angler age, and the level of awareness of fishing regulations.

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