Use of an Angler Incentive Program for Data Collection and Management of a Trophy Bass Fishery

Michael J. Ryan, *Texas Parks and Wildlife Department, 3802 East End Blvd. S., Marshall, TX 75672*

Michael W. Brice, *Texas Parks and Wildlife Department, 3802 East End Blvd. S., Marshall, TX 75672*

Loraine Fries, *Texas Parks and Wildlife Department, A. E. Wood Fish Hatchery, 507 Staples Rd., San Marcos, TX 78666*

Abstract: One hundred and seventy-six trophy-size (≥3.6 kg) largemouth bass *(Micropterus salmoides),* entered into a privately-sponsored catch-and-release program at Caddo Lake, Texas/Louisiana, were tagged and monitored to assess angler recapture rates, genetic composition, and their distribution within the lake. All largemouth bass program entries were scanned for tags to determine angler recapture rates over a 4-year period. Blood samples were obtained from initial entries and used to determine genetic composition using random amplified polymorphic DNA testing. Genetic data were used to evaluate the success of past stocking activities. Angler-reported catch locations were used to examine temporal and spatial distribution of initial and recaptured largemouth bass entries. Most (77.2%) of the largemouth bass entries were caught during March (46.9%) and April (30.3%). Twenty-three (13.1%) of the 176 largemouth bass were recaptured at least once and 4 (2.3%) were recaptured twice. The distance between initial and recapture locations ranged from 0.0 to 7.5 km (μ = 2.8 km) and corresponding time intervals between catches for individual fish ranged from 8 to 1,059 days(μ = 281 days) for all tagged fish returns (N = 27). Estimated genotypic composition of the entries was 15.5% Florida largemouth bass *(M. s. floridanus),* 45.1% F_1 first generation hybrids, and 39.4% F_x non-first generation hybrids, indicating successful Florida gene introgression following stocking activities that occurred 15 years earlier. Most (85%) of the initial and recaptured largemouth bass entries were caught in the middle portion of Caddo Lake, suggesting habitat associations possibly related to the avoidance of oxygen deficient areas in the lake and/or homing tendencies. Our results indicate this angler incentive program was highly utilized and trophy largemouth bass were recycled. Compared to electrofishing, the program provided a more efficient means for gathering genetic and catch distribution information on trophy-size largemouth bass.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 56:26–37

Trophy-size largemouth bass are difficult to obtain through traditional sampling methods (e.g., electrofishing), thus limiting a manager's ability to assess the status of these individuals or evaluate the success of trophy bass management programs (Wilson and DiCenzo 2002). This has led managers in the southern United States to consider sampling approaches that utilize angler-caught largemouth bass through taxidermy and angler incentive programs. Horton and Gilliland (1993) utilized a taxidermy network to gather age and genetic information on ≥3.6-kg largemouth bass to evaluate the contribution of Florida largemouth bass to the trophy fishery in Oklahoma. Crawford et al. (1996) also utilized a taxidermy network to determine age distribution, growth rates, and seasonal harvest distribution for trophy (≥4.5 kg) largemouth bass in Florida. Many states, including Texas, have used angler-supplied (i.e., individual and tournament) records to track trends in largemouth bass populations and catch rates of large fish (Van Horn and Birchfield 1981, Farman et al. 1982, Weiss-Glanz and Stanley 1984, Gabelhouse and Willis 1986, Ebbers 1987, Dolman 1991, Prentice et al. 1993). Texas Parks and Wildlife (TPW) has relied on its ShareLunker program to obtain genetic information on trophy (>5.9 kg) largemouth bass since 1986 (Forshage and Owens 2000).

Information on catch locations of trophy largemouth bass is often highly guarded by anglers. However, if available, catch location data could be extremely beneficial to the management of a fishery, providing important insight to biologists and anglers. With catch location data, inferences could be drawn regarding distribution and habitat associations of trophy largemouth bass. Betsill et al. (1986), Mesing and Wicker (1986), Lyons (1993), Furse et al. (1996), and Woodward and Noble (1997) used telemetry to study home range and habitat selection of largemouth bass under a variety of seasonal, environmental, and ecological conditions. However, with the exceptions of Mesing and Wicker (1986) and Furse et al. (1996), most of the largemouth bass utilized in those studies weighed <2.0 kg. In the absence of telemetry data, distribution and habitat associations might be identified using angler-supplied information on catch locations of largemouth bass. Lantz and Carver (1975), Healy (1990), Stang et al. (1996), and Gilliland (1999) used tagged, tournament-caught largemouth bass to determine dispersion from release sites, but they did not attempt to associate recapture locations with habitat.

Following the introduction of Florida largemouth bass in 1981–1982, a popular trophy largemouth bass fishery developed at Caddo Lake, Texas-Louisiana when anglers began reporting frequent catches of trophy-size largemouth bass in the early 1990s. Five largemouth bass >5.9 kg from Caddo Lake have been submitted to the TPW ShareLunker Program between 1990 and 1998. During that same period, standard electrofishing surveys conducted by TPW yielded only 3 trophy-size bass, limiting our ability to examine their genetic or distribution characteristics within the lake. Both methods were considered important to evaluate the success of past stocking efforts, address significant habitat issues, and promote this important fishery. However, neither method provided sufficient numbers of trophy-size largemouth bass for evaluation purposes.

In February 1997, we were presented with a unique opportunity to gather much needed genetic and distribution information on a trophy largemouth bass fishery at Caddo Lake through a privately-sponsored angler incentive program called the Bass Life Associates (BLA) Trophy Replica Program. Bass Life Associates, a group of pro-active, conservation-minded anglers, initiated this program at Caddo Lake to encourage anglers to release largemouth bass ≥3.60 kg. Anglers who catch a qualifying largemouth bass receive a size-dependent discount on the cost of a fiberglass replica mount: 3.60–4.07 kg = 50%, 4.08–4.52 kg = 75%, and ≥4.53 kg = 100%. To participate in the BLA Trophy Replica Program, anglers who catch a largemouth bass ≥3.6 kg must obtain a certified weight of the fish and release it in good condition at 1 of 3 participating marinas on the lake. Since its inception in 1993, over 500 largemouth bass have been entered into the program.

We were intrigued with the uniqueness of the BLA Trophy Replica Program and felt that, compared to conventional sampling approaches, it could provide increased access to trophy-size largemouth bass. In order to evaluate the BLA Trophy Replica Program for obtaining data on trophy-size largemouth bass, we conducted a 3-year tagging study. Our objectives were to: 1) determine the number of BLA largemouth bass entries recaptured by anglers; 2) identify genetic composition of program entries; 3) utilize angler-reported catch locations to monitor temporal and spatial distribution of initial and recaptured entries; and 4) identify habitat associations based on distribution of ≥3.6 kg largemouth bass.

We thank K. Webb, D. McCutcheon, M. Echols, J. Byrd, and other members of Bass Life Associates for implementing the Trophy Replica Program in an effort to sustain and enhance trophy fishing opportunities at Caddo Lake. This study would not have been possible without their enthusiasm and assistance in funding. Our thanks to the many guides and anglers who participated in this study and to owners/operators Mr. and Mrs. R. Holder, Caddo Grocery; Mr. and Mrs. J. King, Kool Point Marina; Mr. and Mrs. R. Hines, Mr. and Mrs. K. McDaniel, Shady Glade Marina; and the Caddo Parish Parks and Recreation staff at Earl Williamson Park for their assistance in processing BLA largemouth bass entries. We extend our sincere appreciation to R. Luebke, D. Terre, M. Webb, and T. Bister for reviewing this manuscript and to F. Janssen for GIS assistance. This study was funded by the Federal Aid in Sport Fish Restoration Act, Grant F-30-R of the TPW.

Methods

Caddo Lake (10,800 ha), the largest natural lake in Texas, is located in Northeast Texas on the Texas-Louisiana border. The mean depth is 1.5 m and the lake is subject to frequent water level fluctuations. An abundance of habitat in the form of inundated brush, bald cypress trees *(Taxodium distichum),* and aquatic macrophytes is present contributing to quality largemouth bass, crappie (*Pomoxis* spp.), and sunfish (*Lepomis* spp.) fisheries. Upstream reservoir construction in the watershed since the 1950s has altered the flow regime and contributed to excessive growth of native and non-native aquatic macrophytes in Caddo Lake. Noxious growth persists for 5–6 months in most (>75%) of the upper third of lake contributing to the loss of aquatic habitat from anoxic conditions that develop annually.

A trophy largemouth bass fishery developed in the late 1980s following the stocking of over 5.1 million Florida largemouth bass since 1981. The lake record for largemouth bass was broken several times between 1989 and 1992. The current lake record is 7.27 kg and was caught 13 April 1992.

Beginning in February 1997, TPW began this study in cooperation with BLA and 3 marinas that served as official BLA weigh-in sites on Caddo Lake. Each participating marina operator was given a copy of guidelines outlining processing procedures and reporting requirements. Marina operators were given a ledger to record the following information on individual entries: angler name, address, telephone number, the time and date of catch; and the certified weight (g), total length (mm), and girth (mm) of the fish. A digitized grid map was also given to each marina operator for anglers to use to reference grid coordinates for reporting the catch location of their entry. Though not specifically required for participation in the program, anglers were asked to voluntarily disclose the catch location for their entry only if it was accurate.

After weighing an entry, marina operators were instructed to place the fish in a holding net suspended in the lake adjacent to their pier or boat stalls and contact a TPW biologist who would come to the marina to tag and process the fish. Holding nets were constructed of 2.5-cm stretch-coated nylon mesh and were 1.2m in diameter x 1.5m deep.

Upon arrival at the marina, TPW biologists recorded information on the entry from the ledger and began processing the fish. Each fish was removed from the holding net and placed into a 15-liter vat containing an un-iodized saturated salt solution to anesthetize the fish. Once immobilized, largemouth bass were tagged with a coded 10-digit Biomark Passive Integrated Transponder (PIT) tag using methods described by Harvey and Campbell (1989). A Biomark Small Tag Injector (ST112) was used to inject a 125-kHz (TX 1400L) PIT tag posterior to the base of the pelvic girdle of each specimen. The PIT tag was injected sub-cutaneously approximately 5mm deep. Additionally, a numbered, self-piercing No. 3-Monel strap tag was attached to the left operculum of each entry. The PIT and strap tag numbers for individual fish were recorded. Tagging was not conducted during the months of June through October when elevated water temperatures and low dissolved oxygen concentrations contributed to higher stress on captured largemouth bass.

To determine genotype, approximately 0.10-cc of blood was extracted from the afferent branchial vein or efferent branchial artery on the last gill arch of largemouth bass entries with a 0.3-cc syringe. Blood samples were not procured from all entries because of variable responses of largemouth bass to anesthesia. If we were unsuccessful in extracting a blood sample or the fish was not sufficiently sedated, samples were not collected in order to reduce additional stress or injury to the fish. Each blood sample was stored in a plastic centrifuge vial, numbered according to entry, placed on ice, and later frozen at the laboratory. Blood samples were transferred to the A. E. Wood Fish Hatchery in San Marcos, Texas, for genotyping using random amplified polymorphic DNA (Williams et al. 1998). Genotypes were categorized as Florida largemouth bass (FLMB), first generation hybrids (F_1), non-first generation hybrids (F_X), or northern largemouth bass (NLMB) and the percentage occurrence for each was calculated.

Following processing, each largemouth bass entry was immediately returned to the holding net and allowed to recover prior to release. When fully recovered, the fish was removed, scanned to insure the PIT tag had been retained, and released at the marina. A Biomark Mini Portable Reader Model HS5900L was used to detect the presence of PIT tags.

After the first largemouth bass entry had been tagged, subsequent entries were checked for the presence of a strap tag and scanned by marina personal to detect the presence of PIT tags. When an external strap tag was observed or a PIT tag was detected, the tag numbers, length and weight of the largemouth bass, and grid coordinates of the catch location were recorded and the fish was immediately released. Although tagging was not conducted after 31 May 1999, marina operators were instructed to continue to scan all largemouth bass entries and report tag numbers through May 2001.

A random sample of 25 largemouth bass were collected from a bass tournament held on 7 March 1997 at Caddo Lake and used as a control to evaluate handling mortality and tag retention. The fish ranged from 458 to 587 mm (TL) and were transported in a 757-liter tank to the Tyler State Fish Hatchery. Tournament-caught largemouth bass were processed according to methods previously described and stocked into a 1.2-ha. pond which was drained 30 days later to determine handling mortality and tag retention. Additionally, PIT tag retention was further evaluated using a sample of 87 brood bass at the Texas Freshwater Fisheries Center in Athens, Texas. Largemouth bass brood fish were injected with PIT tags according to methods previously described above and released into a hatchery pond on 10 June 1998. The pond was drained 614 days later and largemouth bass were scanned to determine PIT tag retention.

Results and Discussion

A total of 176 largemouth bass entries were tagged and released (Table 1). Thirty-day handling mortality was 8.0% for control largemouth bass suggesting 14 of the 176 largemouth bass that we processed may have died following release. PIT tag retention (614-days) for hatchery brood bass was 99%. Strap tag retention was variable throughout the study, but tags were often lost within 6–12 months.

Twenty-three largemouth bass (13.1%) were recaptured at least 1 time, of which 4 (2.3%) were recaptured twice. The total return (15.4%) of tagged (N = 176) largemouth bass entries was encouraging considering tagging occurred over a 3-year period. Most (55.0%) of the largemouth bass entered into the BLA Trophy Replica Program between 1997 and 2001 were caught during March and April (Fig. 1). Most (77.2%) of the entries that we processed between 1997 and 1999 were also caught during March (46.9%) and April (30.3%), suggesting high seasonal vulnerability to angling and/or proportionally higher fishing effort. Our results were similar to catch statistics reported for trophy largemouth bass on TPW's statewide top 50 largemouth bass list (6.87–8.24 kg); 74% of these fish were caught between February and May.

Blood samples were extracted from 59.7% (N = 105) of the initial entries. As a

Table 1. Entry, recapture, and release data collected on largemouth bass during a catch-and-release angler angler incentive program at Caddo Lake, Texas-Louisiana, February 1997–May 2001.

Entry type	*N*	Ratio (%)
Total initial entries	183	
Total initial entries released alive	176	176/183 (96%)
Entries recaptured once	23	23/176 (13%)
Entries recaptured once and released alive	19	19/23 (83%)
Entries recaptured twice	4	4/19 (21%)
Entries recaptured twice and released alive	2	2/4 (50%)

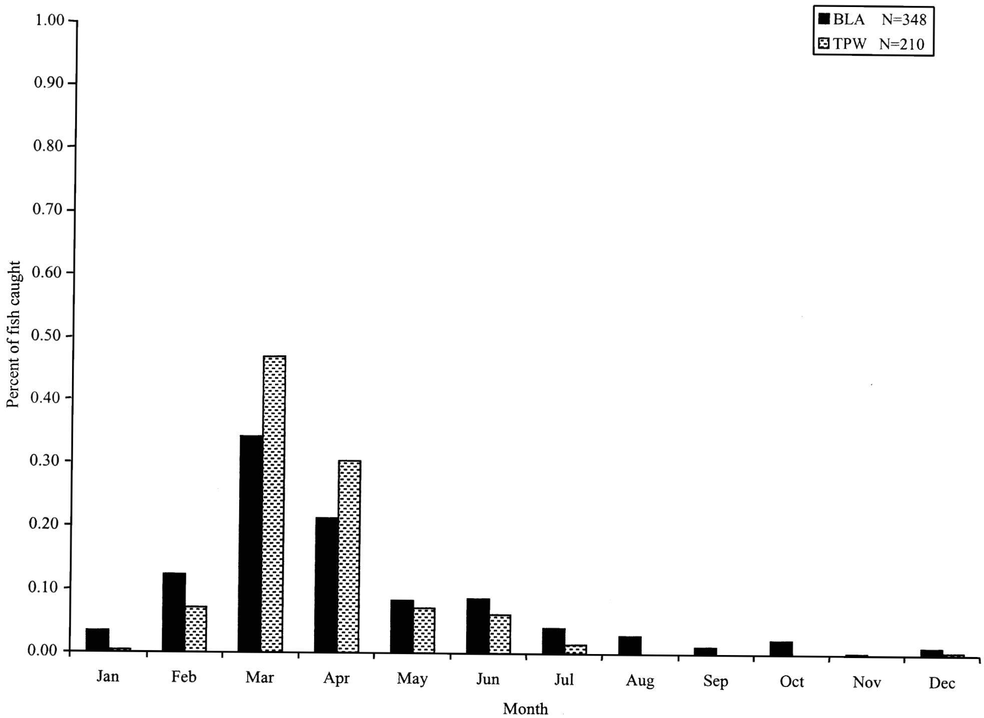

Figure 1. Percent catch by month of largemouth bass entered into a catch-and-release angler incentive program at Caddo Lake, Texas-Louisiana, February 1997–2001. The percent of Bass Life Associates (BLA) entries is compared with the percent of fish processed and tagged by Texas Parks and Wildlife (TPW).

Table 2. Genetic composition (%) of largemouth bass (>3.6 kg) collected during a catch-and-release angler incentive program (BLA) at Caddo Lake, Texas-Louisiana. February 1997–May 1999. Electrophoretic results for y-o-y largemouth bass collected by Texas Parks and Wildlife (TPW) with electrofishing gear, October, 1992 are also listed. Sample size in parentheses. FLMB=Florida largemouth bass, F_1=first generation hybrids, F_x=non-first generation hybrids, and NLMB=northern largemouth bass.

Sample source	FLMB	F_1	F_x	NLMB	Total
BLA	15.5 (11)	45.1 (32)	39.4 (28)	0.0 (0)	100 (71)
TPW[a]	0.0 (0)	20.0 (6)	56.7 (17)	23.3 (7)	100 (30)

a. Ryan (1996).

result of sample degradation, genotypic identification was obtained on only 71 of the largemouth bass sampled. Genetic composition of BLA largemouth bass entries was 15.5% FLMB (N = 11), 45.1% F_1 (N = 32), and 39.4% F_X (N = 28) genotypes (Table 2). Florida largemouth bass were initially stocked in Caddo Lake in 1981 and 1982 into a presumably northern subspecies-dominated population (Philipp et al. 1983) and genetic composition of BLA largemouth bass entries indicated successful introgression of Florida largemouth bass genes 15 years following introduction.

A similar observation has been made through the ShareLunker Program where all fish ≥5.9 kg (>300 entries) with identifiable genotypes have been either Florida largemouth bass, first generation, or non-first generation hybrids (TPW, unpubl. data). Florida genotypes were present in most (93%) of the trophy (≥3.6 kg) largemouth bass harvested in Oklahoma reservoirs (Horton and Gilliland 1993). Our study results did not indicate the presence of NLMB genotypes in BLA largemouth bass entries; however, they compared favorably with those mentioned above and further emphasize the contribution FLMB introductions have made in the development of trophy fisheries.

Although no NLMB were represented in our samples, Ryan (1996) reported this genotype comprised 23.3% of the y-o-y largemouth bass sampled (N = 30) during electrofishing at Caddo Lake in 1992. Northern largemouth bass are even more vulnerable to angling than F_1's (Garrett 2002) and, therefore, the absence of NLMB in our samples was unexpected. Evidently, growth characteristics alone probably excluded this genotype from meeting minimum weight criteria for entry into the program. Florida largemouth bass genotypes were absent in 1992 electrophoretic samples indicating that the genotypic composition of y-o-y largemouth bass was not comparable to the trophy segment of a population.

Most (85%) of the entries that we processed were caught in the middle portion (approximately 4,000 ha) of Caddo Lake adjacent to the Texas-Louisiana border (Fig. 2). Although we used only information that anglers voluntarily provided, we are satisfied that most of the angler-reported catch locations were reliable and sufficiently accurate to determine distribution of largemouth bass reported in this study.

Distances between initial (1C) and second recapture (2C) catch locations ranged from 0.0 to 7.5 km (μ = 2.8 km) (Table 3). Seven largemouth bass entries were re-

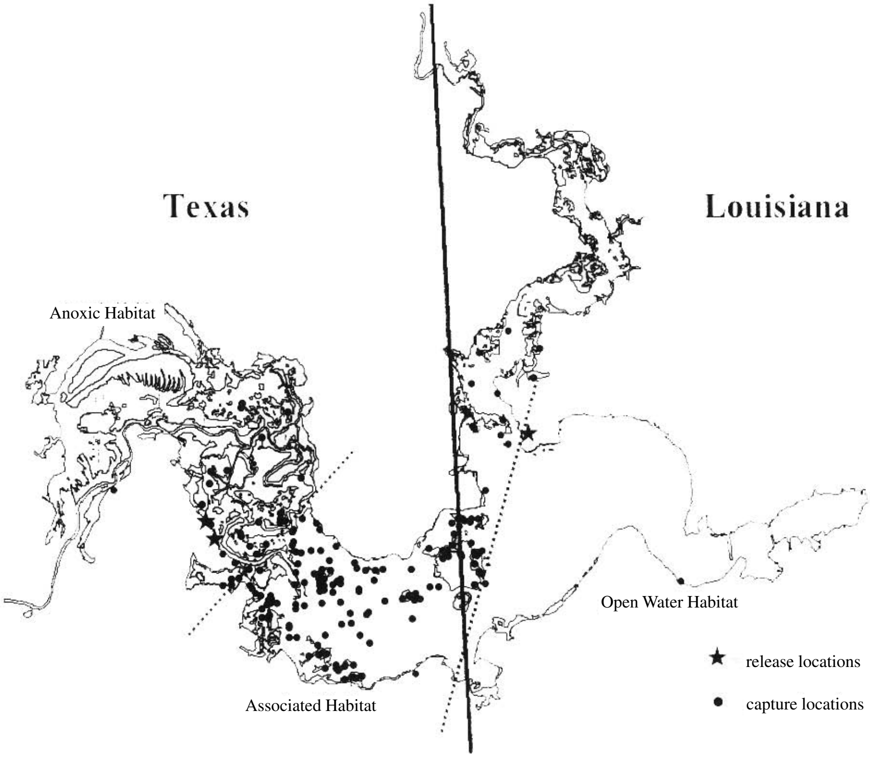

Figure 2. Habitat types, largemouth bass release sites, and angler-reported capture locations of largemouth bass caught during a catch-and-release angler incentive program at Caddo Lake, Texas-Louisiana February 1997–May 2001.

captured <1.0 km from locations where they had been initially caught, indicating possible homing tendencies. Others have reported similar movement/homing behavior with displaced largemouth bass in large water bodies (Mesing and Wicker 1986, Richardson-Heft et al. 2000). Four of the 7 fish were recaptured <100 days following release. The mean distance from release (1R, 2R) to recapture locations for all recaptured (2C, 3C) fish was 5.2 km and 4.7 km, respectively, and ranged from 0.6 to 12.4 km. Corresponding time intervals between release (1R, 2R) and recapture (2C, 3C) ranged from 8 to 1,059 days. Two largemouth bass entries recaptured 14 and 36 days following initial release were caught <1.0 km from release points. Based on temporal and spatial distribution of recaptured fish, many of the released entries returned relatively quickly to the same general area where they were initially captured.

Lack of suitable habitat may explain why only 15% of BLA largemouth bass entries were reportedly caught in the upper and lower end of Caddo Lake over the study period. The middle portion is comparatively deeper (3.0–5.0 m) than the upper

Table 3. Distance (kilometers) and time interval (days) data of catches of largemouth bass collected by anglers during a catch and release angler incentive program conducted at Caddo Lake, Texas, 1997 to 2001. Columns are labeled with numbers (1, 2, or 3) to denote frequencies and with letters (R = release and C = catch) to denote locations.

	Distance				Time interval	
	1R-2C	1C-2C	2R-3C	2C-3C	1R-2C	2R-3C
Mean	5.2	2.8	4.7	4.0	299.7	171.2
Range	0.9–12.4	0.0–7.5	0.6–9.5	0.4–7.2	8–1059	36–311
N	21	23	4	4	23	4

end of Caddo Lake. Dissolved oxygen concentrations are higher and remain sufficient (>3.0 mg/liter) to support fish populations throughout the year in the middle section of the lake. An abundance of structural and vegetative habitat is also present there. In contrast, dissolved oxygen concentrations are <1.0 mg/liter during summer and fall in the shallower and heavily vegetated upper third (approximately 3,000 ha) of the lake. Persistent anoxic conditions (June - November) occur annually and probably influence seasonal distribution of many fish species in this section of the lake. Extremes in habitat conditions in the upper end of Caddo Lake may preclude establishment of home ranges for many species of fish or at best, contribute to seasonal migration when dissolved oxygen conditions approach lethal levels. Furse et al. (1996) reported largemouth bass in the Kissimmee River, Florida, either died or moved away from water containing <1.0 mg/liter dissolved oxygen, but returned to established home ranges when concentrations were above lethal levels. Conversely, a large portion of the habitat in the deeper (6–7.0 m), well-oxygenated lower end of the lake (approximately 3,500 ha.) can be characterized as open water with low densities of aquatic macrophytes and standing timber. Based on angler-reported catch locations and the diversity of habitat characteristics present, our data strongly suggests that the middle section of the lake provides the most suitable habitat for trophy largemouth bass (≥3.6 kg), and these fish tend to stay there all year.

Management Implications

This angler incentive program provided TPW biologists with an excellent opportunity to monitor the recapture of BLA program entries, gather an abundance of genetic information, determine seasonal fishing success, monitor dispersion of released fish, and identify habitats most likely to yield rare, trophy-size (≥3.6 kg) largemouth bass to anglers at Caddo Lake. These data could not have been gathered as efficiently or effectively using conventional sampling methodologies. The BLA Trophy Replica Program was a more efficient alternative of sampling largemouth bass ≥3.6 kg (>580 mm) compared to electrofishing, providing a more cost-effective method to access high numbers of trophy largemouth bass. Largemouth bass ≥ 580 mm (*N* = 176) were collected at a rate of 0.52 fish/man-hour (travel and processing time = 336 man-hours) during this study compared to 0.02 fish/man-hour (*N* = 3) in

144 man-hours (3 men; 4 hours/man/day) expended during electrofishing collections over an 8-year period. This study gave TPW biologists a tool to collect an abundance of information that can be utilized to protect and promote trophy bass fishing at Caddo Lake.

It is unknown what impacts the BLA Trophy Replica Program may have had on the fishery. For example, we do not know if harvest of trophy largemouth bass would have been different in the absence of this catch-and-release program. Since many anglers practice catch and release, we suspect that many of the largemouth bass entries would have probably been released anyway. Nevertheless, the program provided anglers with an alternative to mounting trophy largemouth bass. By providing an incentive to anglers to encourage the live release, largemouth bass ≥3.6 kg were recycled and caught again.

Data gleaned from the BLA Trophy Replica Program can also be used to monitor annual trophy fishing success. A wealth of anecdotal information was generated from this study and is now available to anglers. Information on seasonal fishing success and catch location has been distributed and utilized by anglers, possibly increasing catch rates of largemouth bass ≥3.6 kg and maximizing trophy fishing benefits at Caddo Lake.

Although TPW had not implemented its angler recognition program in the early 1980s and lake records were not documented, angler-reported catch of trophy largemouth bass ≥3.6 kg were very rare at Caddo Lake. Based on BLA records (>500 entries since 1993) and the genotypic composition of largemouth bass entries observed in this study, effects of Florida bass introductions and their contribution to the development of trophy fishing opportunities can be better appreciated. Genetic makeup of y-o-y largemouth bass and BLA entries were exclusive for FLMB and NLMB genotypes, respectively. Based on this study, genetic composition apparently was influenced by size and/or age. Consequently, managers should consider size/age of largemouth bass represented in a sample when interpreting data used to assess genotypic characteristics of introgressed populations.

The catch distribution of largemouth bass entries observed in this study may have been influenced by availability of suitable habitat and may have implications on management priorities at Caddo Lake. Distribution and habitat associations of trophy largemouth bass suggests the upper third of the lake was not conducive in attracting trophy largemouth bass, as proportionally few entries were reported caught there. This section of the lake experiences annual water quality problems that may have been a factor influencing distribution. Our results support growing concerns over water quality and habitat degradation at Caddo Lake and accentuate the need for the development and implementation of an aggressive management plan to address these issues.

The BLA Trophy Replica Program may provide future opportunities to collect life history and performance data on trophy largemouth bass that could be used to further enhance management of the fishery at Caddo Lake. For example, distribution and habitat associations of BLA largemouth bass entries reported in this study could be validated using radio-telemetry technology.

Finally, this study provided a means whereby fishing organizations, anglers, and TPW could work together in a cooperative environment, each participant sharing in the common goal of making fishing better. This collaborative effort generated good will and enthusiasm among participants, providing opportunities to exchange information, educate constituents, and enhance public relations.

Literature Cited

Betsill, R. K., R. L. Noble, and W. H. Neill. 1986. Distribution and habitat selection of telemetered northern and Florida largemouth bass in 2 small Texas impoundments. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 40:275–286.

Crawford, S., W. F. Porak, D. J. Renfro, and R. L. Cailteux. 1996. Age and growth of trophy largemouth bass in Florida. Proc. Annu. Conf. Southeast. Assoc. Fish. and Wildl. Agencies 50:212–220.

Dolman, W. B. 1991. Comparison of bass-club tournament reports and creel survey data from Texas reservoirs. North Am. J. Fish. Manage. 11:177–184.

Ebbers, M. A. 1987. Vital statistics of a largemouth bass population in Minnesota from electrofishing and angler-supplied data. North Am. J. Fish. Manage. 7:252–259.

Farman, R. S., L. A. Nielsen, and M. D. Norman. 1982. Estimating largemouth bass abundance using creel census and tournament data in the fishing-success method. North Am. J. Fish. Manage. 2:249–256.

Forshage, A. F. and T. Owens. 2000. ShareLunker: A Texas trophy bass program. Annu. Proc.Texas Chap. Am. Fish. Soc. 22:3–4.

Furse, J. B., L. J. Davis, and L. A. Bull. 1996. Habitat use and movements of largemouth bass associated with changes in dissolved oxygen and hydrology in Kissimmee River, Florida. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 50:12–25.

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 Am. J. Fish. Manage. 6:481–489.

Garrett, G. P. 2002. Behavioral modification of angling vulnerability in largemouth bass through selective breeding. Pages 387–392 *in* D. P. Philipp and M. S. Ridgeway, eds. Blackbass: ecology, conservation and management. Am. Fish. Soc. Symp. 31, Bethesda, Md.

Gilliland, E. R. 1999. Dispersal of black bass following tournament release in an Oklahoma reservoir. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 53:144–149.

Harvey, W. D. and D. L. Campbell. 1989. Retention of passive intergrated transponder tags in largemouth bass brood fish. Prog. Fish-Cult. 51:164–166.

Healey, T. P. 1990. Movement and survival of tournament-caught black bass at Shasta Lake. Calif. Fish and Game 76:36–42.

Horton, A. H. and E. R. Gilliland. 1993. Monitoring trophy largemouth bass in Oklahoma using a taxidermist network. Proc. Annu. Conf. Southeast. Assoc. Fish. and Wildl. Agencies 47:679–685.

Lantz, K. E. and D. C. Carver. 1975. Dispersal of tournament caught bass from a central release point. Proc. Annu. Conf. Southeast. Assoc. Game and Fish Comm. 29:115–118.

Lyons, B. W. 1993. Distribution and habitat selection of Florida and northern largemouth bass in Lake Tawakoni, Texas. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 47:633–641.

Mesing, C. L. and A. M. Wicker. 1986. Home range, spawning migrations, and homing of radio-tagged Florida largemouth bass in two central Florida lakes. Trans. Am. Fish. Soc. 115:286–295.

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. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 47:666–678.

Philipp, D. P., W. F. Childers, and G. S. Whitt. 1983. A biochemical genetic evaluation of the northern and Florida subspecies of largemouth bass. Trans. Am. Fish. Soc. 112:1–20.

Richardson-Heft, C. A., A. A. Heft, L. Fewlass, and S. B Brandt. 2000. Movement of largemouth bass in northern Chesapeake Bay: relevance to sportfishing tournaments. North Am. J. Fish. Manage. 20:493–501.

Ryan, M. J. 1996. Statewide freshwater fisheries monitoring and management program, survey report for Caddo Lake, 1995. Fed. Aid in Sport Fish Restor., F-30-R-20, Texas Parks and Wildl. Dep., Austin. 52 pp.

Stang, D. L., D. M. Green, R. M. Klindt, T. L. Chiotti, and W. W. Miller. 1996. Black bass movements after release from fishing tournaments in four New York waters. Pages 163-171 *in* L. E. Miranda and Dr. DeVries, eds. Multidimensional approaches to reservoir fisheries management, Am. Fish. Soc. Symp. 16, Bethesda, Md.

Van Horn, S. L. and L. J. Birchfield. 1981. The North Carolina largemouth bass catch survey. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 35:453–459.

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

Williams, D. J., S. Kazianis, and R. B. Walter. 1998. Use of random amplified polymorphic DNA (RAPD) for identification of largemouth bass subspecies and their intergrades. Trans. Am. Fish. Soc. 127:825–832.

Wilson, D. M. and V. DiCenzo. 2002. Profile of a trophy largemouth bass fishery in Briery Creek Lake, Virginia. Pages 583–592 *in* D. P. Philipp and M. S. Ridgeway, eds. Black-bass: ecology, conservation, and management. Am. Fish. Soc. Symp. 31, Bethesda, Md.

Woodward, K. O. and R. L. Noble. 1997. Over-winter movements of adult largemouth bass in a North Carolina reservoir. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 51:113–122.