PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-33

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2007 Survey Report

Toledo Bend Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Toledo Bend Reservoir were surveyed in 2007 and 2008 using electrofishing and gill netting. Anglers were surveyed from June 2007 to May 2008 with a creel survey. This report summarizes the results of the surveys and contains a management plan for the reservoir.

- **Reservoir description:** Toledo Bend Reservoir is a 162,476-acre (71,000 acres in Texas) impoundment of the Sabine River in Newton, Sabine, and Shelby counties in southeast Texas. Water level fluctuations average 5 feet annually, but reached the historic low in 2006 (11 feet below conservation pool). Aquatic habitat consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber.

- **Management history:** Historically, the black bass fishery has been the most popular at Toledo Bend Reservoir. Typically, 55 - 70% of annual angling effort is directed at black bass. Approximately 20 - 30% of anglers target crappie. With the exception of 2006, Florida largemouth bass (FLMB) have been stocked annually since 1990 to increase FLMB alleles in the population. The Louisiana Department of Wildlife and Fisheries (LDWF) stocks Florida largemouth bass and striped bass annually. Joint efforts with LDWF have resulted in standardization of most harvest regulations, but differences still exist for crappie and catfish. In 1998, giant salvinia was discovered in Toledo Bend Reservoir. In 2004, plant coverage exceeded 3,000 acres and impeded angler access. Low water levels in 2005 and 2006 reduced coverage to < 300 acres. However, from 2006 to 2007 coverage increased to 1,770 acres. Control methods have included annual herbicide treatments at access points, releases of salvinia weevils, and a water level drawdown.

- **Fish community**
  - **Prey species:** Gizzard shad, threadfin shad, and bluegill were the most abundant prey species and provided ample forage for sport fish**.**

  - **Catfishes:** Abundance of blue catfish was stable compared to previous years, while channel catfish numbers declined. Angling catch rate averaged 2.2/h. Blue catfish and flathead catfish provided trophy opportunities for anglers.

  - **Temperate basses:** White and striped bass were present in the reservoir in low numbers. However, a popular white bass fishery exists in the Sabine River above the reservoir. Yellow bass numbers were high in the reservoir, as angling catch rate averaged 7.5/h and annual harvest was approximately 30,000 fish.

  - **Black basses:** Spotted bass were present in low numbers. Largemouth bass abundance was high and stable compared to previous years; size structure and fish condition were good. The black bass fishery was most popular (62.4% of total fishing effort). Angling catch rate was high (1.1/h).

  - **Crappie:** White crappie and black crappie were present in the reservoir. Angling catch (1.6/h) and total annual harvest (67,189 fish) reflected an abundant crappie population.

- **Management strategies:** Stock FLMB annually to maintain and improve large fish abundance. Monitor largemouth bass population annually with electrofishing (both spring and fall) and creel surveys. Continue tournament-monitoring program and supplemental creel questions to more effectively monitor large fish abundance. Monitor giant salvinia coverage to document plant distribution and effects of control measures. Publish monthly articles in the *Lakecaster* highlighting TPWD activities.

INTRODUCTION

This document is a summary of fisheries data collected from Toledo Bend Reservoir in 2007 and 2008. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2007 and 2008 data for comparison.

Reservoir Description

Toledo Bend Reservoir is an impoundment of the Sabine River in Newton, Sabine, and Shelby counties in southeast Texas. The Sabine River Authority (SRA) constructed the reservoir in 1966 for municipal, industrial, and agricultural water supply, generation of hydroelectric power, and recreational use. At conservation pool (172 feet above mean sea level), Toledo Bend Reservoir is 162,476 surface acres (71,000 acres in Texas), has a shoreline length of 1,200 miles, and a mean depth of 20 feet. Water level fluctuations average 5 feet annually (Figure 1). However, water levels reached historic lows in 2006 (161.3 feet) (Figure 1). The reservoir was eutrophic with a mean Carlson's Trophic State Index chl-*a* of 46.7 (Texas Commission on Environmental Quality, unpublished data). Angler and boat access was good with 33 public access areas present on the Texas side of the reservoir. Habitat at time of sampling consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber. Most of the land around the reservoir is used for timber production, agriculture, and residential development. Other descriptive characteristics for Toledo Bend Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Driscoll 2006) included:

1. Stock Florida largemouth bass (FLMB) annually (100 fingerlings/acre) in 5,000-acre embayment until pure FLMB constitute > 20% of the population within embayment.
   Action: Since 2000, FLMB have been stocked annually in Housen Bayou embayment. Embayment FLMB alleles ranged from 38.8 (2003) – 52.7 (2002) (Table 12).
2. Conduct annual electrofishing (fall and spring) and creel surveys to monitor status of largemouth bass population and examine growth every four years.
   Action: Surveys were conducted from 2005 to 2008 and indicated relatively stable population abundance and angling success. Growth was examined in 2007.
3. Continue black bass tournament-monitoring program to increase information on relative abundance of large fish (> 20 inches).
   Action: Since 2004, data from 38 tournaments have been included and summarized in Appendix C.
4. In conjunction with LDWF, standardize recreational harvest regulations for crappies (10-inch minimum length limit, 50-fish bag limit) and catfishes (LDWF statewide regulations).
   Action: Discussions were held with LDWF field staff, but the political climate in Louisiana has not been conducive for standardization.
5. Conduct annual vegetation surveys to monitor giant salvinia and hydrilla abundance and recommend management strategies.
   Action: Annual vegetation surveys have been conducted since 1998. Aerial flights have been conducted since 2006. Giant salvinia is distributed reservoir-wide and reached 3,000 acres in 2004 (Table 4). Herbicide treatments have targeted access points to reduce potential transfer to other waters. High emphasis has been placed on public education via press releases and signage at all public Toledo Bend-Texas boat ramps. Boom placement at boat ramps has been discussed with SRA. Reservoir-wide control options discussed with SRA included annual salvinia weevil releases and a fall/winter

water level drawdown.

6. Conduct gillnetting surveys every two years to monitor the status of catfish populations and examine growth every four years.
   Action: Surveys were conducted in 2006 and 2008. Growth was examined in 2008.
7. Publish monthly popular articles in the *Lakecaster*, a newsletter distributed to 30 counties in Texas and Louisiana.
   Action: Articles highlighting TPWD activities at Toledo Bend Reservoir have been published monthly since 2000.

Harvest regulation history: Only catfishes in Toledo Bend Reservoir are currently managed with TPWD statewide regulations (Table 2). Bag or length limit exceptions to statewide regulations result from efforts to standardize regulations with LDWF. Regulations for temperate basses and black basses are standardized but TPWD and LDWF regulations for catfishes and crappies are different.

Stocking history: Since 1990, Toledo Bend Reservoir has received annual stockings of FLMB (only exception was 2006) (Table 3). Since 2000, FLMB have been stocked in a 5,000-acre embayment (Housen Bayou – 100 fingerlings/acre) to maximize stocking influence. Since 1992, striped bass have been stocked annually by LDWF. TPWD stocked surplus striped bass fingerlings in 2002. The complete stocking history is in Table 3.

Vegetation/habitat history: Historically, aquatic vegetation coverage at Toledo Bend Reservoir (primarily hydrilla) has exceeded 20,000 surface acres. Since 2003, hydrilla has ranged from 1,516 acres (2005) to 3,020 acres (2007) (Table 4). Although hydrilla is listed on the TPWD list of prohibitive plants, it is considered beneficial at Toledo Bend Reservoir, as coverage has never been problematic or caused access problems. Nuisance exotic species include giant salvinia and water hyacinth. Although both species are distributed reservoir-wide, a majority of plant biomass is located in shallow, backwater areas (headwaters of both the reservoir and major embayments).

METHODS

Fishes were collected by electrofishing (2 hours at 24 5-min stations during October and March [largemouth bass only]) and gill netting (15 net nights at 15 stations during February). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Average ages for 12-inch channel catfish and 14-inch largemouth bass were determined from otoliths. Water level data were obtained from the SRA website.

A sample of 30 age-0 largemouth bass was subjected to DNA microsatellite analysis in accordance with Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

A roving creel survey (36 days; 9 days per quarter) was conducted from June 2007 to May 2008 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Total angler catch of largemouth bass $\geq$ 4, 7, and 10 pounds was also estimated. Anglers were asked if released fish were within weight categories. Harvested fish

lengths were converted to weights for classification (19 inches = 4 pounds; 23 inches = 7 pounds; 25 inches = 10 pounds).

An aquatic vegetation survey was conducted in 2007 via an aerial flight. Coverages were calculated for all prevalent species.

Results of largemouth bass tournaments collected as part of an approved special project to supplement population information collected from electrofishing and creel surveys are included in Appendix C.

RESULTS AND DISCUSSION

Habitat: A habitat survey conducted in 2003 indicated that the littoral zone included primarily dead timber, hydrilla, boat docks, and native emergent vegetation (Driscoll 2004). Over 60,000 acres of standing timber were present in Texas waters. In 2007, overall coverage of beneficial vegetation (hydrilla and American lotus) was 5% of the surface area and similar to 2006 (Table 4). Compared to 2006, giant salvinia coverage was similar while water hyacinth abundance increased.

Creel: Similar to previous survey years, fishing effort at Toledo Bend Reservoir was primarily directed at black basses (62.4%) and crappies (18.6%) (Table 5). Total fishing effort for all species was 324,205 h and declined from previous years (Table 6). Total directed expenditures ($2,445,561) were similar to the previous survey year.

Prey species: Primary prey species included gizzard shad, threadfin shad, and bluegill. All three species provided abundant prey. Gizzard shad catch rates in 2005 (135.5/h), 2006 (119.0/h), and 2007 (101.0/h) were similar (Figure 2) and exceeded the historical reservoir average (1986 – 2004; 91.1/h). Historically, threadfin shad catch rates have been highly variable (182.3/h; SD = 219.0) and are probably not reflective of population status. The catch rate in 2007 was 96.0/h (Appendix A). Bluegill catch rates have increased during the last three survey years (2005 – 253.5/h; 2006 – 474.5/h; 2007 – 510.5/h) (Figure 3). Few anglers sought sunfish (3.0% of total fishing effort) (Table 5), but they were frequently harvested by anglers seeking other species (Table 7).

Catfish: Since 2005, blue catfish recruitment has been relatively steady. Catch rates ranged from 6.6 - 7.0/nn (Figure 5) and exceeded the historical average of 4.5/nn. The number of preferred-size fish ($\geq$ 30 inches) increased in 2006 and was similar in 2008. Fish were in good condition as Wr ranged from 82 – 130.

Historically, channel catfish catch rates have been relatively low (1.6/nn). Although catch rates in 2005 (5.3/nn) and 2006 (6.8/nn) were relatively high, catch decreased in 2008 (2.6/nn) (Figure 6). Population size structure was dominated by smaller fish (PSD range = 14 – 29). In 2008, average age of 12-inch (11.5 - 12.5 inches) channel catfish was 3.9 years (N = 9; range = 3 – 4 years).

Directed rod and reel angler effort, catch, and harvest rates of catfishes increased in 2007 – 2008 (Table 8). Catfish anglers accounted for 8.9% of the total fishing effort (Table 5). Total estimated harvest was 39,148 fish; 86% of harvested fish were channel catfish (Figure 8).

Temperate basses: Historically, gill net catch rates of white bass have averaged 1.6/nn, reflecting a low-density population in the reservoir. During the last three survey years, catch rates ranged from 1.1 - 3.4/nn (Figure 9). In 2007 and 2008, no directed fishing effort was observed, but anecdotal information suggests a popular fishery exists in the Sabine River upstream of the reservoir.

Striped bass have been stocked annually by the LDWF to support broodfish procurement for palmetto bass production. Few striped bass were observed in gill net (Figure 11) and creel surveys (Figure 12) and directed angling effort was low (Table 5).

Creel surveys indicated yellow bass abundance was relatively high. Angling catch rate was high (7.5/h; Table 19) and 29,989 fish were harvested (Figure 10).

Black bass: Spotted bass were present in the reservoir, but few were collected by electrofishing (Figure 13). Less than 3,000 fish were harvested in 2007 – 2008 (Figure 16).

Fall electrofishing catch rates during 2005 to 2007 reflected relatively high and stable largemouth bass recruitment rates (range = 109.0 - 146.3/h; Figure 14). The historical reservoir average is 142.0/h. Population size structure was similar across years (PSD range = 36 - 50; RSD-14 range = 15 – 25). Relative weights ranged from 88 – 110, indicating largemouth bass were in good condition. Growth of largemouth bass was good; average age at 14 inches (13.5 - 14.5 inches) was 2.0 years (N = 14; range = 1 – 4 years).

Spring electrofishing catch rates were higher than fall surveys (range = 129.3 – 207.5/h) (Figure 15). In 2008, relatively high catch (207.5/h) reflected increased largemouth bass recruitment. Spring surveys also indicated higher proportions of larger fish (PSD range = 54 – 65; RSD-14 range = 23 – 31).

The majority of total fishing effort at Toledo Bend Reservoir (62.4%) was directed at black basses (Table 5). From 2005 to 2008, angler catch rates were relatively high and consistent, exceeding 0.8/h during all three survey periods (Table 11). Total directed effort (199,547 h) and harvest (43,195) declined considerably in 2007 and 2008. Proportion of fish retained during tournaments increased in 2007 and 2008 (41% of total harvest). Total catch of fish $\geq$ 4 pounds was similar during the last two survey years (3,562 and 3,230 fish, respectively). Estimated catch of fish > 7 pounds was 332 in 2006; none were observed during creel surveys in 2007 and 2008 (Table 11).

Since 2002, FLMB alleles in the reservoir have remained relatively constant (range = 24.0 – 33.8%) (Table 12). Since 2000, FLMB have been stocked in a 5,000-acre embayment (100/acre) to increase stocking influence. Embayment FLMB alleles (range = 38.8 – 52.7) were higher than the reservoir and were 52.3% in 2007.

A tournament-monitoring program was implemented in June 2004 to increase information on legal-size fish ($\geq$ 14 inches) and provide greater insight regarding large (> 20 inches) fish abundance (Appendix C). Overall, results were variable but reflect relatively high abundance of legal-size fish and desirable numbers of larger fish. Proportion of teams catching limits (5 legal-size fish) ranged from 30.1 – 44.6%. Average winning weights ranged from 20.9 – 24.8 pounds and in 2007, proportion of teams with weights > 15 pounds was 12.5%. Across years, average big bass weight ranged from 8.5 – 9.2 pounds. In 2007, a total of 14 largemouth bass > 8 pounds were weighed in seven tournaments.

Crappie: Historically, trap net catch rates of crappie (both white and black) have been low (2.3/nn). Trap net surveys were discontinued in 2004.

Creel data reflected a relatively stable and viable crappie fishery that was second only to the black bass fishery in terms of total fishing effort (18.6%; Table 5). During 2005 – 2008, angler catch rates were high and stable, ranging from 1.3 – 1.9/h (Table 13). However, total directed effort (59,419 h) and harvest (67,189 fish) declined considerably in 2007 – 2008.

Fisheries management plan for Toledo Bend Reservoir, Texas

Prepared – July 2008

ISSUE 1: Creel surveys indicate most sportfishing effort at Toledo Bend Reservoir is for largemouth bass. The reservoir also hosts a considerable number of annual bass tournaments (20% of black bass effort). Tournament-monitoring data reflects angler catch of large fish (> 8 pounds) and the reservoir has produced four ShareLunkers (latest in 2008).

MANAGEMENT STRATEGIES

1. Continue annual embayment stocking of FLMB (100/acre stocked in a 5,000-acre area) to maintain and improve large fish numbers. In 2009, select a new embayment and adopt a strategy of stocking embayments for two consecutive years during a 5-year period. Select additional 5,000-acre embayments if FLMB alleles exceed 70% based on a 30-fish sample of age-0 fish.
2. Continue the tournament-monitoring program to increase information on legal-size fish.
3. Conduct annual electrofishing and creel surveys to monitor status of largemouth bass population.
4. Examine largemouth bass growth every four years.
5. Promote fish handling procedures that minimize tournament-related mortality to minimize impacts on largemouth bass population and reduce conflicts with non-tournament anglers.

ISSUE 2: Giant salvinia coverage has exceeded 3,000 acres and impeded angler access. Transport to other waters is likely.

MANAGEMENT STRATEGIES

1. Monitor giant salvinia coverage annually via aerial flights to document plant distribution and effects of control measures (i.e., herbicides, booms, weevils).
2. At access points, maintain all educational signs and continue herbicide treatments to prevent transport to other waters.
3. Continue discussions with SRA regarding containment boom funding and placement to increase herbicide efficiency and reduce transport potential.
4. Continue to investigate effects of salvinia weevil releases.
5. Continue to communicate with LDWF regarding plant distribution and control measures.

ISSUE 3: TPWD and LDWF harvest regulations differ for crappies and catfishes and confuse anglers.

MANAGEMENT STRATEGY

1. Standardize regulations by implementing a 10-inch minimum length limit, 50-fish bag limit on crappies and adopting LDWF statewide regulations for catfishes (11-inch, 12-inch, and 14-inch minimum length limit for channel, blue, and flathead catfish; 125-fish bag limit in aggregate, with 50 allowed under minimum length limits).

ISSUE 4: The crappie fishery at Toledo Bend Reservoir is significant, accounting for 19% of the total annual fishing effort.

MANAGEMENT STRATEGY

1. Conduct annual creel surveys to monitor the crappie fishery, as trap netting at Toledo Bend Reservoir is not effective.

ISSUE 5: A considerable catfish fishery also exists. Although the rod and reel catfish fishery is minor, the majority of the actual directed catfish effort is likely due to passive gear anglers.

MANAGEMENT STRATEGY

1. Conduct gillnetting surveys every two years to monitor catfish populations and examine growth every four years.

ISSUE 6: Area constituents are interested in TPWD activities and management actions related to Toledo Bend Reservoir and need to be informed.

MANAGEMENT STRATEGY

1. Continue to publish monthly articles on TPWD activities in the *Lakecaster*, a newsletter distributed to approximately 30 counties in Texas and Louisiana.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual electrofishing (both spring and fall) and creel surveys to closely monitor the popular largemouth bass fishery (Table 15). Annual creels are also needed to monitor the crappie fishery due to ineffectiveness of trap nets. Gill net surveys will be conducted every two years to adequately monitor catfish populations. Growth of largemouth bass and catfish will be examined every four years.

LITERATURE CITED

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Driscoll, M. T. 2004. Statewide freshwater fisheries monitoring and management program survey report for Toledo Bend Reservoir, 2003. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Driscoll, M. T. 2006. Statewide freshwater fisheries monitoring and management program survey report for Toledo Bend Reservoir, 2005. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

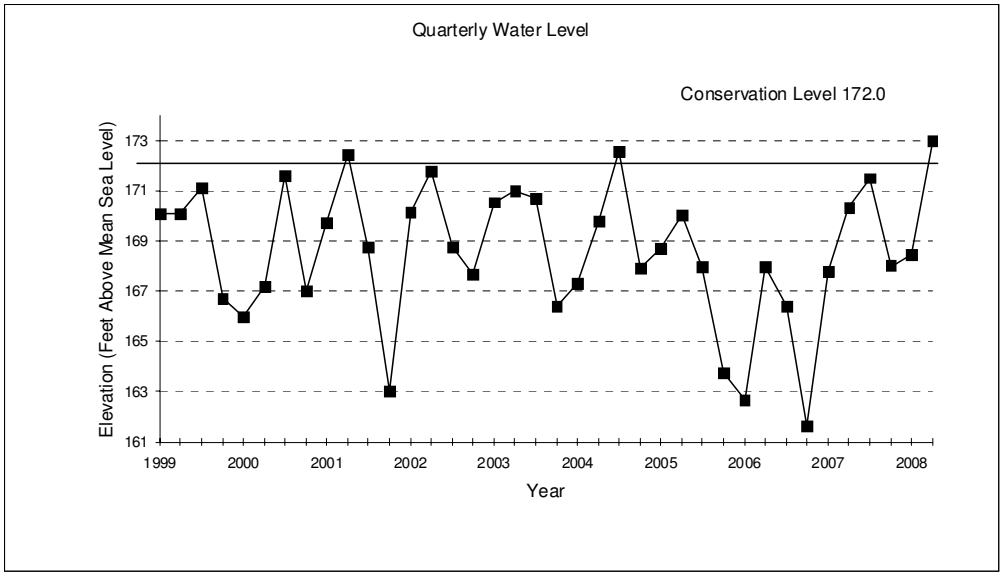


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Toledo Bend Reservoir, Texas.

Table 1. Characteristics of Toledo Bend Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	Sabine River Authority
Counties	Newton, Sabine, and Shelby
Reservoir type	Mainstream
Shoreline Development Index (SDI)	16.25
Conductivity	120 umhos/cm

Table 2. Harvest regulations for Toledo Bend Reservoir, Texas.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish, channel and blue catfish	25 (in any combination)	12 - No Limit
Catfish, flathead	5	18 - No Limit
Bass, white[d]	25	No Limit – No Limit
Bass, striped[d]	5	No Limit – No Limit[a]
Bass, largemouth[d]	8[b]	14 – No Limit
Bass, spotted[d]	8[b]	No Limit - No Limit
Crappie, white and black crappie	50 (in any combination)	10 - No Limit[c]

[a]Only 2 striped bass ≥30 inches may be retained each day.
[b]Bag limit for spotted and largemouth bass is 8 in the aggregate.
[c]No length limit for white and black crappie from December 1 – last day of February; all crappie caught must be retained.
[d]Standardized reservoir-wide regulations.

Table 3. Stocking history of Toledo Bend Reservoir, Texas. Size categories are fry (FRY = < 1 inch), fingerlings (FGL = 1-4 inches), advanced fingerlings (AFGL = 4-8 inches), and unknown (UNK).

Species	Year	Number	Life Stage	Mean TL (in)
Channel catfish	1967	544,745	AFGL	7.9
	Total	544,745		
Flathead catfish	1973	400		UNK
	Total	400		
Florida largemouth bass	1985	225,300	FGL	2.0
	1985	107,323	FRY	1.0
	1988	150,000	FRY	1.0
	1990	446,797	FRY	0.6
	1991	194,714	FGL	1.2
	1991	207,291	FRY	0.9
	1992	406,497	FGL	1.2
	1993	204,653	FGL	1.0
	1993	1,616,523	FRY	0.5
	1994	370,104	FGL	1.2
	1994	733,997	FRY	0.6
	1995	400,007	FGL	1.1
	1996	450,015	FGL	1.2
	1997	234,875	FGL	1.6
	1998	162,837	FGL	1.2
	1998	237,898	FRY	1.0
	1999	1,206,777	FGL	1.5
	2000	321,974	FGL	1.3
	2001	508,505	FGL	1.4
	2002	740,373	FGL	1.5
	2003	961,015	FGL	1.4
	2004	492,536	FGL	1.7
	2005	849,436	FGL	1.5
	2007	502,918	FGL	1.6
	Total	11,732,365		
Largemouth bass	1967	1,689,700	FRY	0.7
	1967	284,300	UNK	UNK
	1987	305	AFGL	6.0
	1987	22,900	FGL	3.0
	Total	1,997,205		

Species	Year	Number	Life Stage	Mean TL (in)
Paddlefish	1992	106,234		7.1
	1995	15,334		2.2
	Total	121,568		
ShareLunker largemouth bass	2006	4,592	FGL	1.8
	Total	4,592		
Striped bass	1974	16,290	FGL	1.7
	1976	60,178	UNK	UNK
	1977	100,200	UNK	UNK
	1979	95,000	UNK	UNK
	1981	96,249	UNK	UNK
	1983	104,133	UNK	UNK
	1984	406,920	FGL	2.0
	1985	484,500	FGL	2.0
	1986	203,000	FRY	1.0
	1988	719,115	FGL	2.0
	1988	29,200	FRY	1.0
	1991	240,364	FGL	1.3
	2002	272,179	FGL	1.7
	Total	2,827,328		

Table 4. Survey of prevalent aquatic vegetation species, Toledo Bend Reservoir, Texas, September 2003 to 2007. Acreage of each species and percent of total surface area coverage (in parentheses) are presented. Surveys from 2003 to 2005 were conduced by boat and 2006 to 2007 surveys were conducted via aerial flights.

Species	2003	2004	2005	2006	2007
American lotus	101 (<1)	1,260 (2)	842 (1)	679 (1)	463 (<1)
Giant salvinia	124 (<1)	3,070 (4)	281 (<1)	1,923 (3)	1,770 (3)
Hydrilla	1,631 (2)	2,109 (3)	1,516 (2)	2,864 (4)	3,020(4)
Potamogeton spp.	56 (<1)	826 (1)	Trace	19 (<1)	Trace
Water hyacinth	1,025 (2)	2,016 (3)	408 (<1)	Trace	888 (1)

Table 5. Percent directed angler effort by species for Toledo Bend Reservoir, Texas, 2005 – 2008.

Species	Year		
	2005/2006	2006/2007	2007/2008
Catfishes	1.5	2.7	8.9
White bass	0.1	0.1	0.0
Yellow bass	1.9	0.1	0.6
Striped bass	0.6	0.0	0.9
Temperate basses	0.5	5.4	1.4
Sunfishes	2.2	1.6	3.0
Black basses	67.4	58.6	62.4
Crappies	21.7	26.9	18.6
Anything	4.0	4.6	4.4

Table 6. Total fishing effort (h) for all species and total directed expenditures at Toledo Bend Reservoir, Texas, 2005 to 2008.

Creel Statistic	Year		
	2005/2006	2006/2007	2007/2008
Total fishing effort	363,835	454,816	324,205
Total directed expenditures	$2,592,065	$2,941,278	$2,445,561

Gizzard shad

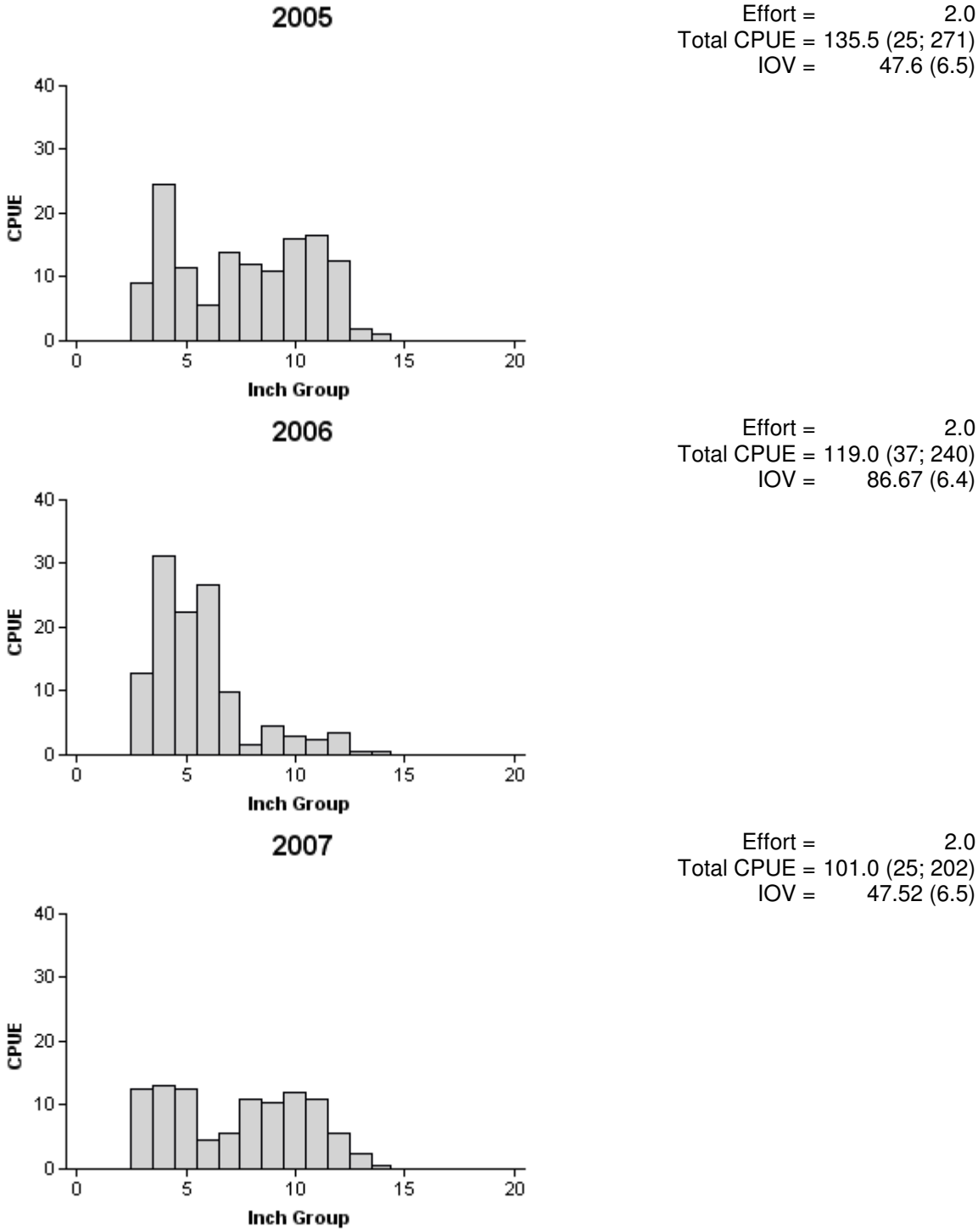
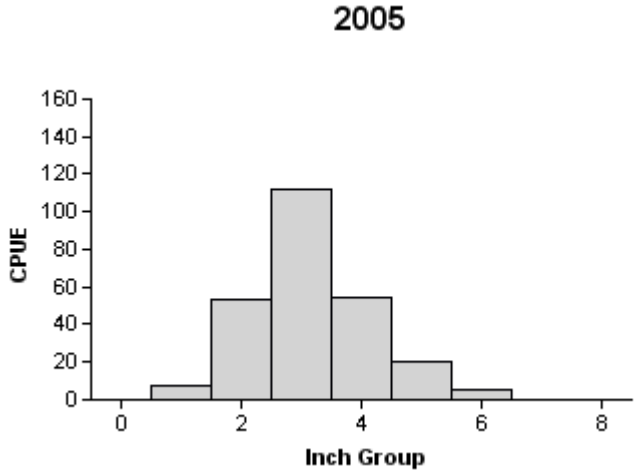
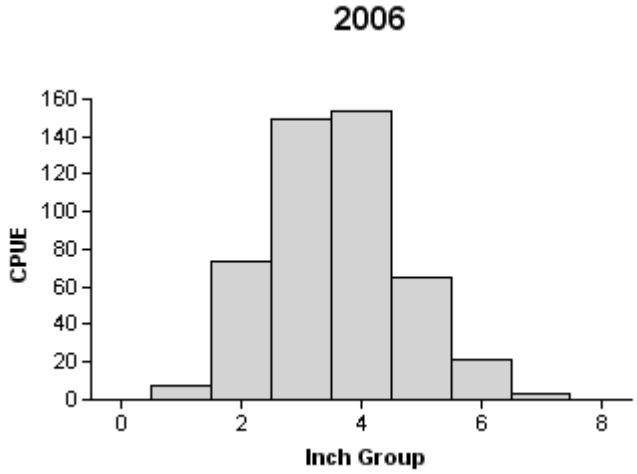


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2007.

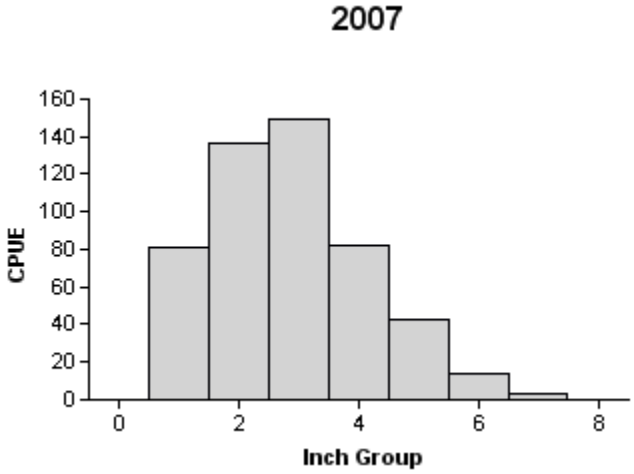
Bluegill



Effort = 2.0
Total CPUE = 253.5 (16; 507)
PSD = 3 (0.9)



Effort = 2.0
Total CPUE = 474.5 (13; 957)
PSD = 6 (1.4)



Effort = 2.0
Total CPUE = 510.5 (13; 1021)
PSD = 6 (1.7)

Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2007.

Sunfishes

Table 7. Creel survey statistics for sunfishes at Toledo Bend Reservoir from June 2005 through May 2006, June 2006 through May 2007, and June 2007 through May 2008, where total catch per hour is for anglers targeting sunfishes and total harvest is the estimated number of sunfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2005-2006	2006-2007	2007-2008
Directed effort (h)	7,975.14 (41)	7,208.96 (43)	9,553.75 (41)
Directed effort/acre	0.11 (41)	0.10 (43)	0.13 (41)
Total catch per hour	2.77 (40)	2.15 (55)	2.35 (43)
Total harvest	28,833.26 (112)	41,084.96 (156)	65,871.17 (64)
Harvest/acre	0.41 (112)	0.58 (156)	0.93 (64)
Percent legal released	16	31	38

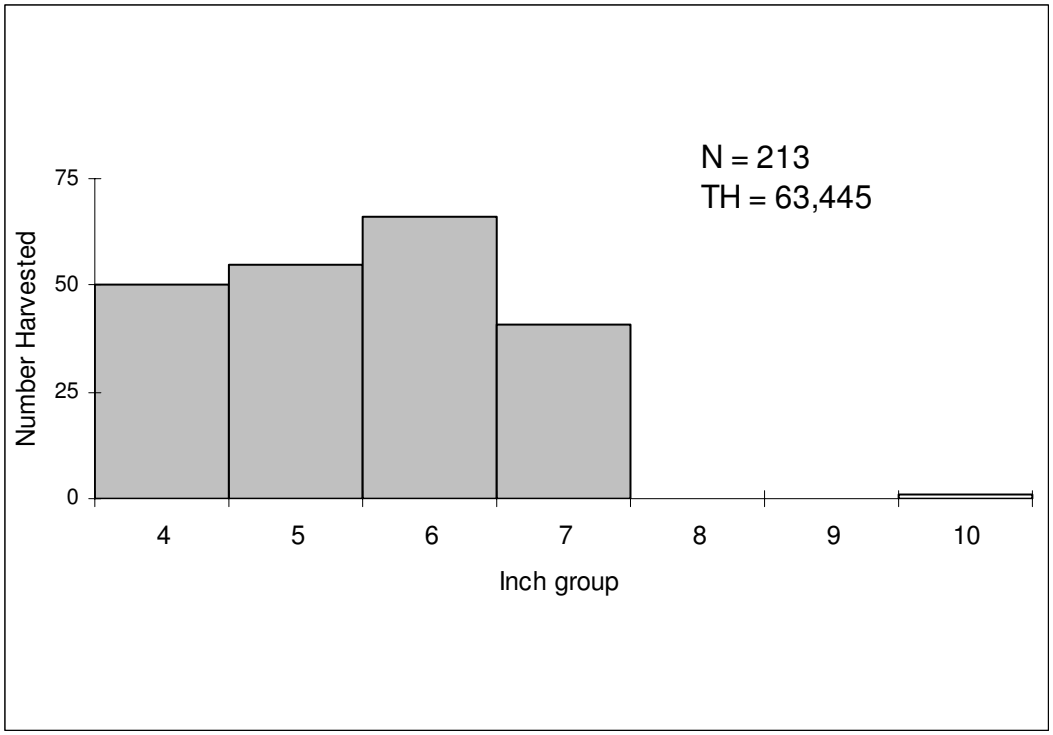


Figure 4. Length frequency of harvested bluegill observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested bluegill observed during creel surveys, and TH is the total estimated harvest for the creel period.

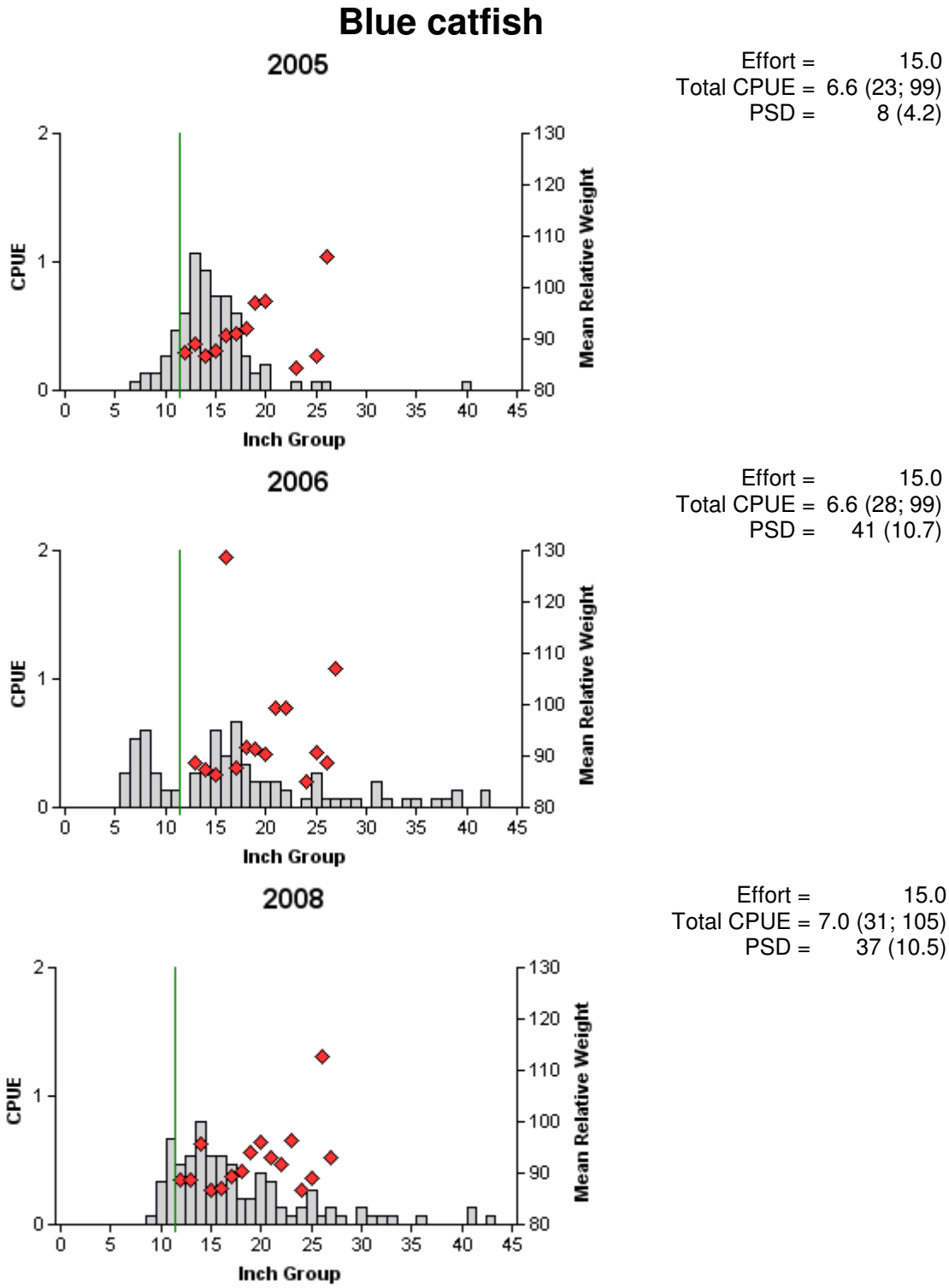


Figure 5. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2008. Vertical lines indicate minimum length limit.

Channel catfish

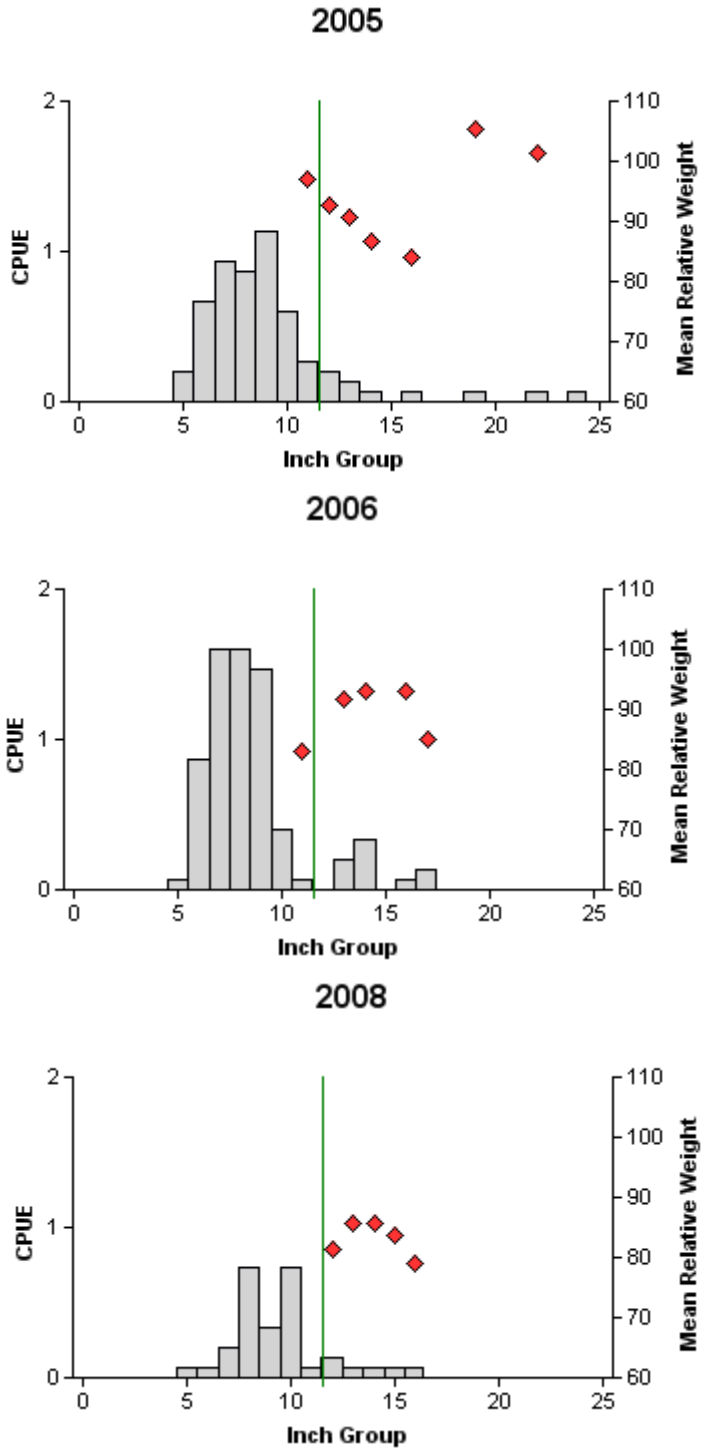


Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2008. Vertical lines indicate minimum length limit.

Catfishes

Table 8. Creel survey statistics for catfishes at Toledo Bend Reservoir from June 2005 through May 2006, June 2006 through May 2007, and June 2007 through May 2008, where total catch per hour is for anglers targeting catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2005-2006	2006-2007	2007-2008
Directed effort (h)	5,512.74 (41)	12,049.84 (35)	28,469.78 (34)
Directed effort/acre	0.08 (41)	0.17 (35)	0.41 (34)
Total catch per hour	1.81 (33)	1.11 (67)	2.23 (31)
Total harvest	18,276.66 (146)	10,429.06 (179)	39,147.56 (42)
Harvest/acre	0.26 (146)	0.15 (179)	0.55 (42)
Percent legal released	2	0	4

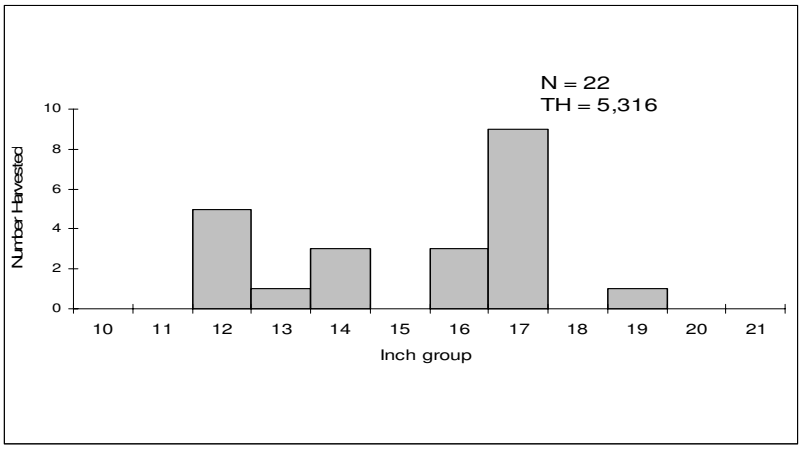


Figure 7. Length frequency of harvested blue catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

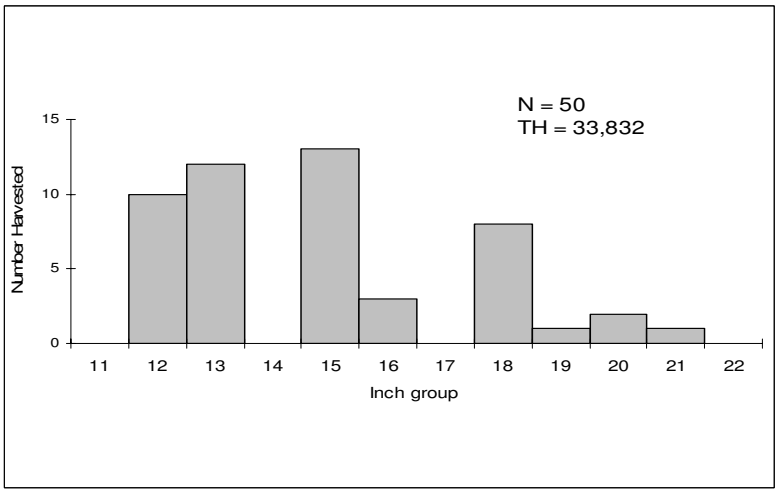


Figure 8. Length frequency of harvested channel catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

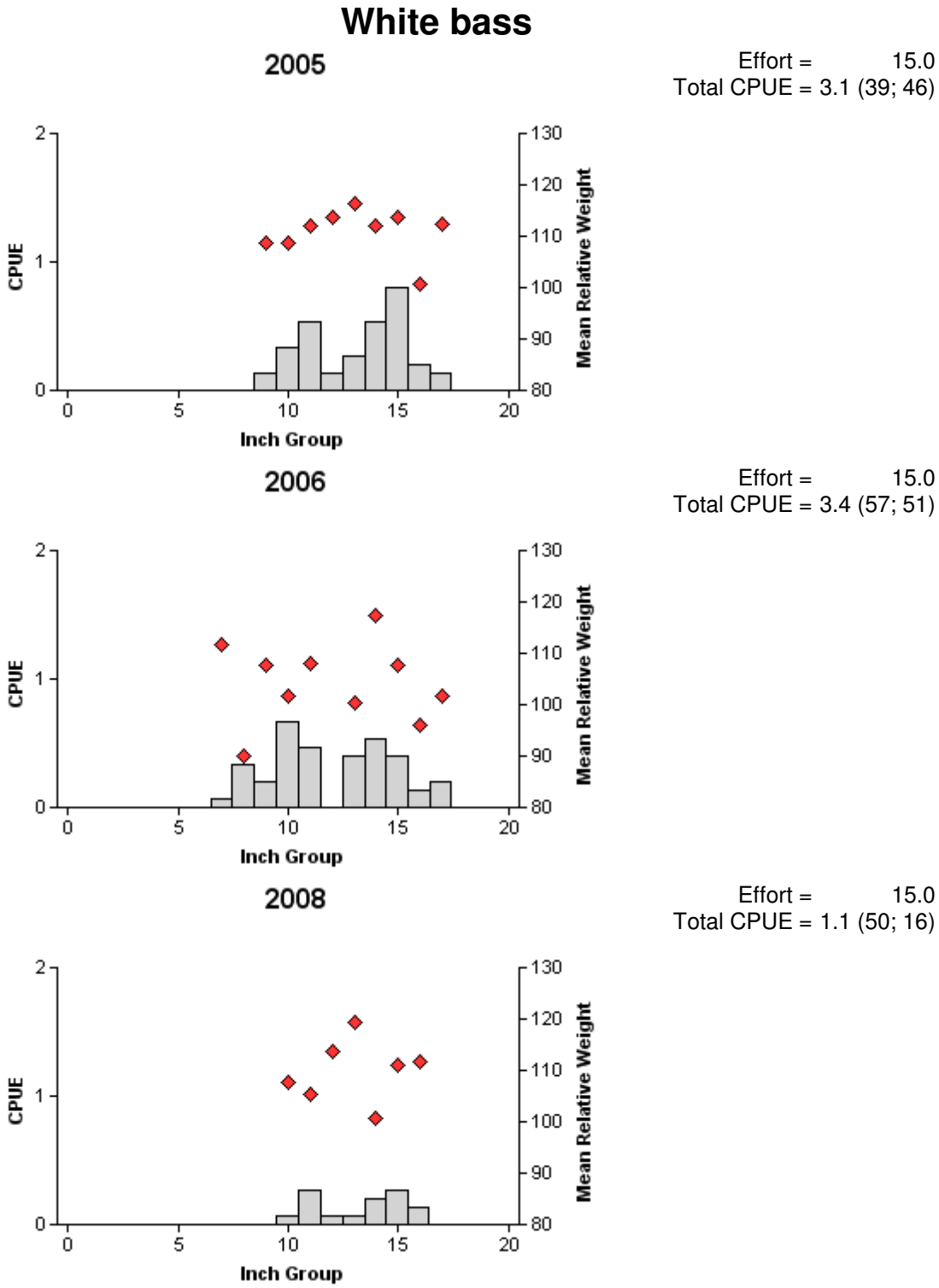


Figure 9. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2008.

Yellow bass

Table 9. Creel survey statistics for yellow bass at Toledo Bend Reservoir from June 2005 through May 2006, June 2006 through May 2007, and June 2007 through May 2008, where total catch per hour is for anglers targeting yellow bass and total harvest is the estimated number of yellow bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2005-2006	2006-2007	2007-2008
Directed effort (h)	6,759.33 (56)	675.23 (111)	1,774.29 (68)
Directed effort/acre	0.10 (56)	<0.01 (111)	0.02 (68)
Total catch per hour	7.85 (90)	5.17 (19)	7.46 (10)
Total harvest	67,136.21 (59)	20,312.04 (71)	29,989.14 (67)
Harvest/acre	0.95 (59)	0.28 (71)	0.42 (67)
Percent legal released	45	37	44

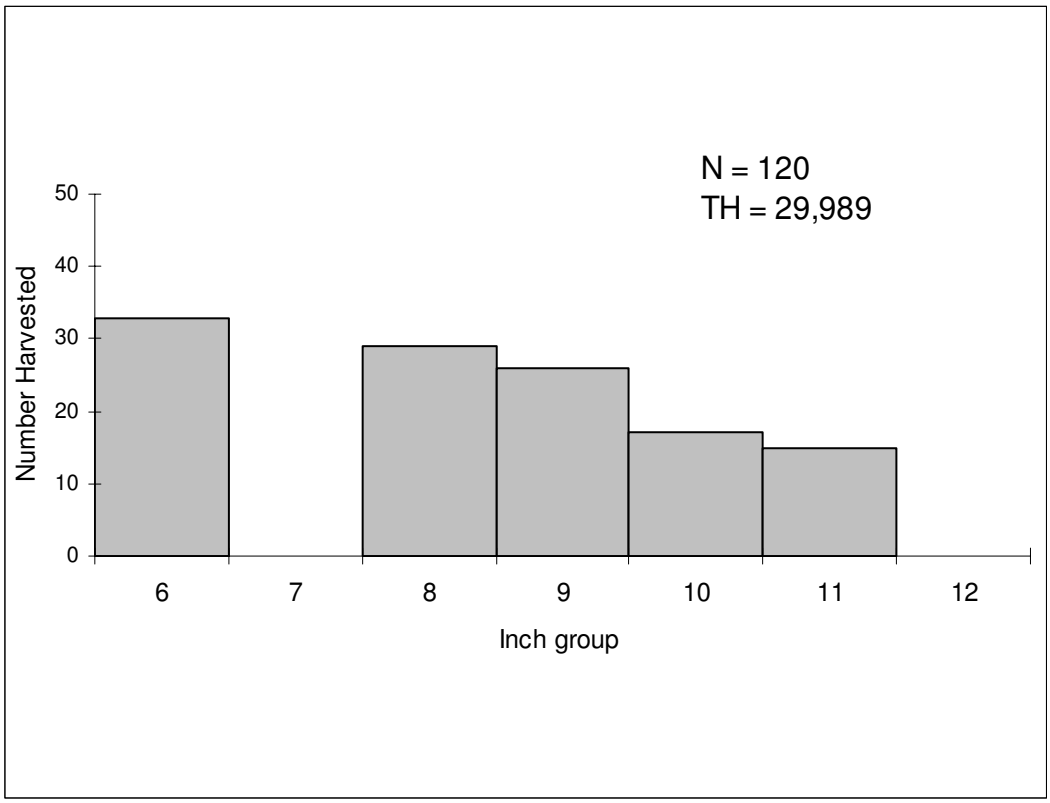


Figure 10. Length frequency of harvested yellow bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested yellow bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

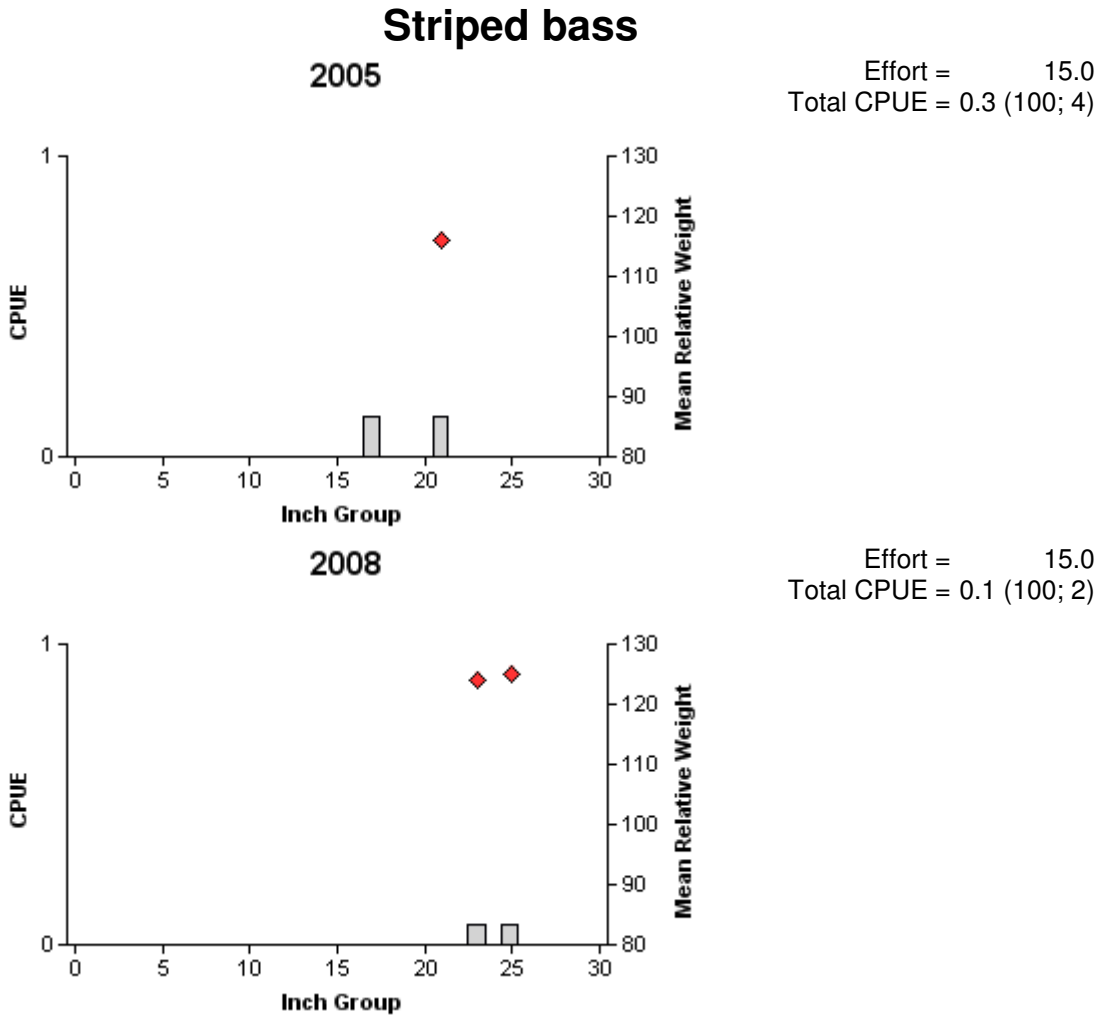


Figure 11. Number of striped bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2008. No fish were collected in 2006.

Striped bass

Table 10. Creel survey statistics for striped bass at Toledo Bend Reservoir from June 2005 through May 2006, June 2006 through May 2007, and June 2007 through May 2008, where total catch per hour is for anglers targeting striped bass and total harvest is the estimated number of striped bass harvested by all anglers. Relative standard errors (RSE) are in parentheses. No directed effort or harvest was observed from June 2006 through May 2007.

Creel Survey Statistic	Year		
	2005-2006	2006-2007	2007-2008
Directed effort (h)	2,421.01 (63)		2,765.26 (58)
Directed effort/acre	0.03 (63)		0.04 (58)
Total catch per hour	0.70 (90)		36.03 (100)
Total harvest	1,627.58 (300)		1,820.60 (335)
Harvest/acre	0.02 (300)		0.03 (335)
Percent legal released	0		93

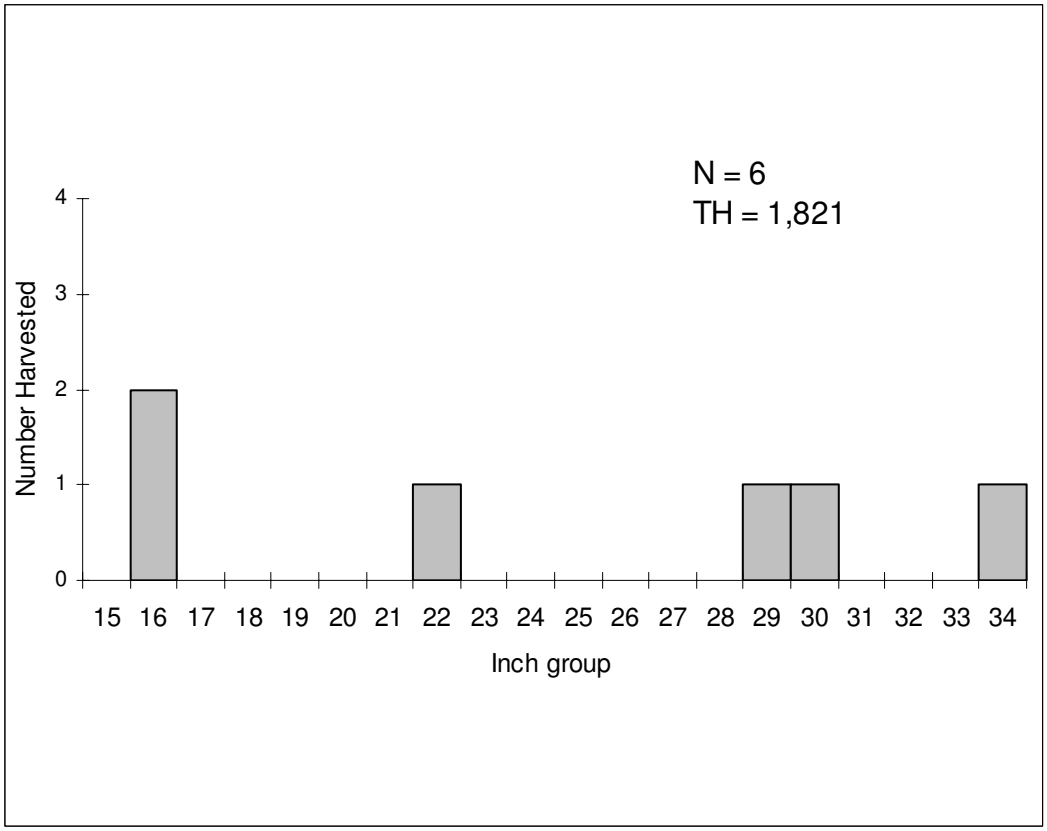


Figure 12. Length frequency of harvested striped bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested striped bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

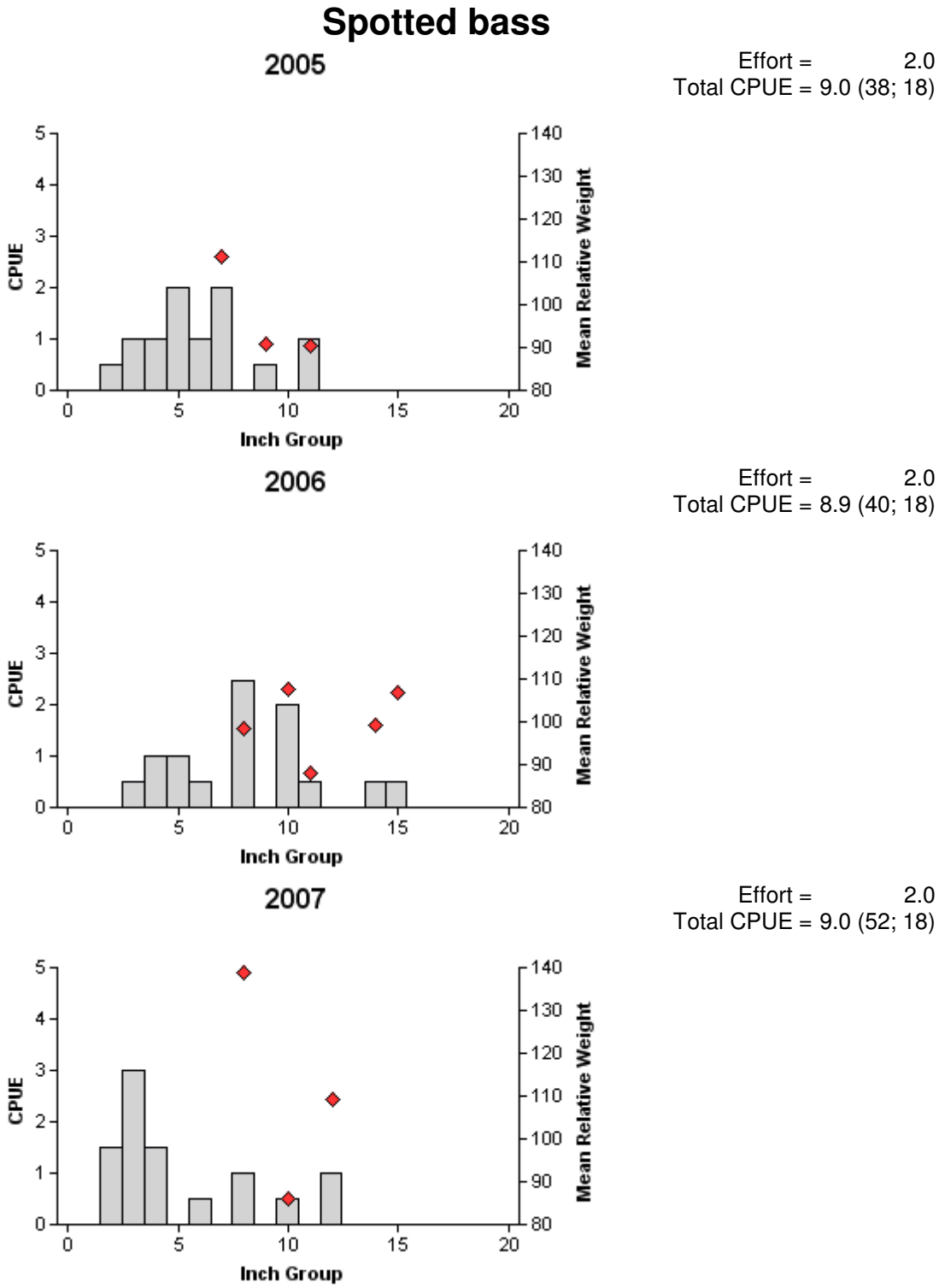
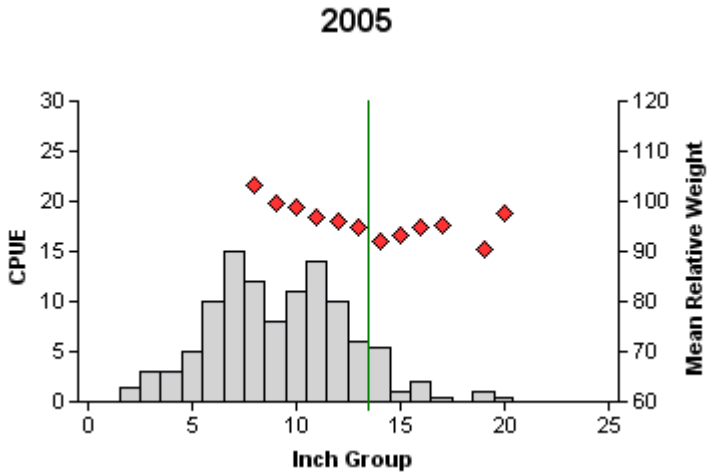
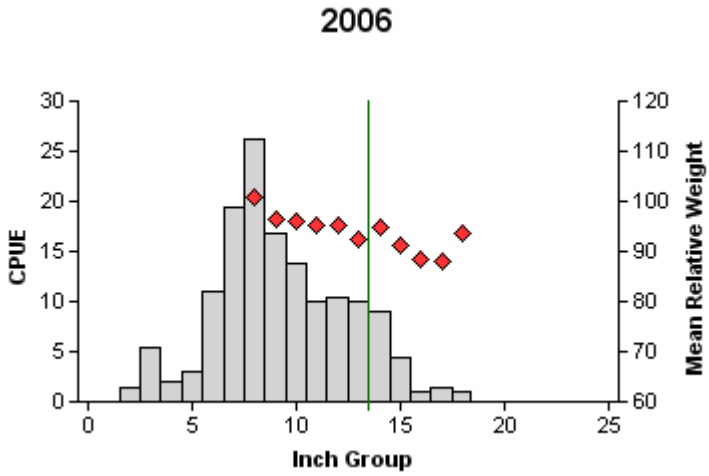


Figure 13. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2007.

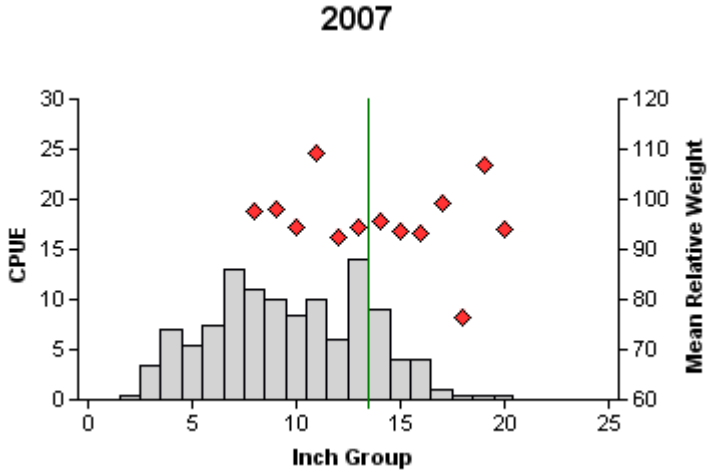
Largemouth bass



Effort = 2.0
Total CPUE = 109.0 (15; 218)
Stock CPUE = 71.5 (18; 143)
PSD = 37 (4.7)
RSD-14 = 15 (3.1)



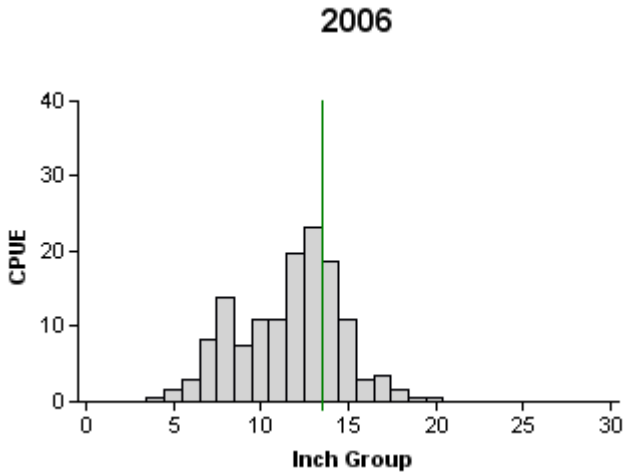
Effort = 2.0
Total CPUE = 146.3 (13; 295)
Stock CPUE = 104.1 (14; 210)
PSD = 36 (4.5)
RSD-14 = 16 (3.4)



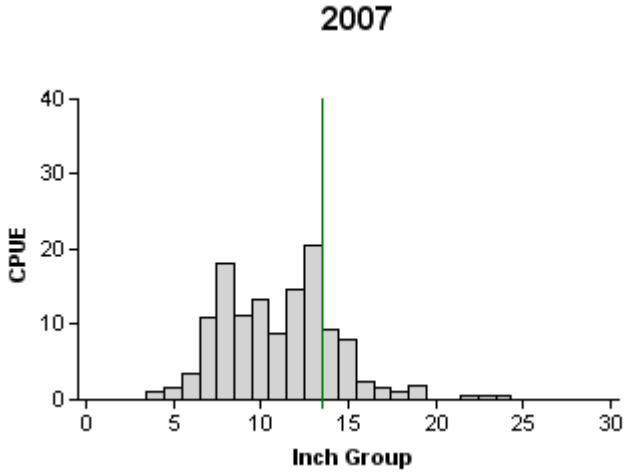
Effort = 2.0
Total CPUE = 116.0 (13; 232)
Stock CPUE = 79.0 (13; 158)
PSD = 50 (5.3)
RSD-14 = 25 (3.8)

Figure 14. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2005, 2006, and 2007. Vertical lines indicate minimum length limit.

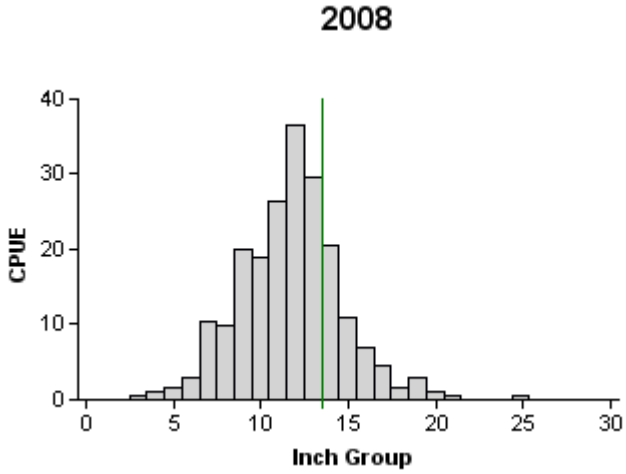
Largemouth bass



Effort = 2.0
Total CPUE = 137.2 (12; 279)
Stock CPUE = 123.9 (12; 252)
PSD = 65 (4.1)
RSD-14 = 31 (2.4)



Effort = 2.0
Total CPUE = 129.3 (14; 263)
Stock CPUE = 112.6 (16; 229)
PSD = 54 (5.7)
RSD-14 = 23 (3.6)



Effort = 2.0
Total CPUE = 207.5 (13; 415)
Stock CPUE = 191.0 (12; 382)
PSD = 60 (3.9)
RSD-14 = 26 (2.5)

Figure 15. Number of largemouth bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Toledo Bend Reservoir, Texas, 2006, 2007, and 2008. Vertical lines indicate minimum length limit.

Black basses

Table 11. Creel survey statistics for black basses at Toledo Bend Reservoir - Texas from June 2005 through May 2006, June 2006 through May 2007, and June 2007 through May 2008, where total catch per hour is for anglers targeting black basses and total harvest is the estimated number of black basses harvested by all anglers. Relative standard errors (RSE) are in parentheses

Creel Survey Statistic	Year		
	2005-2006	2006-2007	2007-2008
Directed effort (h)	244,805.51 (17)	264,759.28 (21)	199,546.56 (18)
Directed effort/acre	3.45 (17)	3.73 (21)	2.81 (18)
Total catch per hour	0.78 (22)	1.25 (42)	1.06 (20)
Total catch			
≥ 4 pound fish		3,562	3,230
≥ 7 pound fish		332	0
≥ 10 pound fish		0	0
Total harvest	135,370.55 (32)	87,696.52 (25)	43,195.12 (16)
Percent harvest tournament-retained		27	41
Harvest/acre	1.91 (32)	1.24 (25)	0.61 (16)
Percent legal released	31	21	62

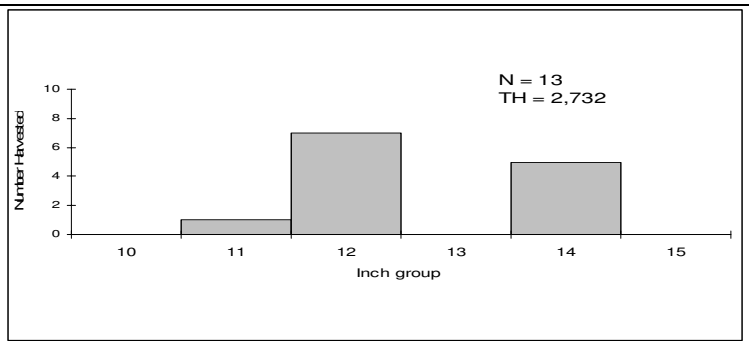


Figure 16. Length frequency of harvested spotted bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

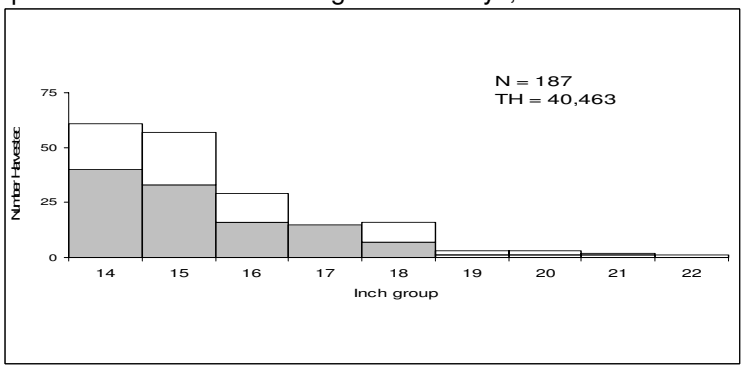


Figure 17. Length frequency of harvested largemouth bass (white = tournament-retained; grey = harvested) observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 12. Results of genetic analysis of largemouth bass collected by fall electrofishing, Toledo Bend Reservoir, Texas, 2002 - 2007. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

		Genotype					
Year	Sample size	FLMB	F1	Fx	NLMB	% FLMB alleles	% pure FLMB
2002	75	1	3	25	45	33.8	1.4
2002[a]	55	0	8	29	18	52.7	0.0
2003	57	1	6	26	24	25.3	1.8
2003[a]	49	4	6	31	8	38.8	8.1
2004	78	2	11	39	26	31.0	2.6
2004[a]	48	7	10	23	8	45.4	14.6
2005	80	1	2	66	11	33.6	1.3
2005[a]	60	3	7	47	3	45.0	5.0
2006	30	0		20[b]	10	24.0	0.0
2006[a]	30	0		27[b]	3	44.6	0.0
2007	30	0		28[b]	2	29.1	0.0
2007[a]	30	2		26[b]	2	52.3	6.7

[a]Housen Bayou stocking embayment
[b]Determination of hybrid status not conducted

Crappies

Table 13. Creel survey statistics for crappies at Toledo Bend Reservoir from June 2005 through May 2006, June 2006 through May 2007, and June 2007 through May 2008, where total catch per hour is for anglers targeting crappies and total harvest is the estimated number of crappies harvested by all anglers. Relative standard errors (RSE) are in parentheses

Creel Survey Statistic	Year		
	2005/2006	2006/2007	2007/2008
Directed effort (h)	78,606.68 (18)	121,531.51 (22)	59,418.61 (23)
Directed effort/acre	1.11 (18)	1.72 (22)	0.84 (23)
Total catch per hour	1.91 (23)	1.27 (30)	1.55 (35)
Total harvest	185,190.72 (36)	106,914.46 (38)	67,189.05 (56)
Harvest/acre	2.61 (36)	1.51 (38)	0.95 (56)
Percent legal released	4	6	4

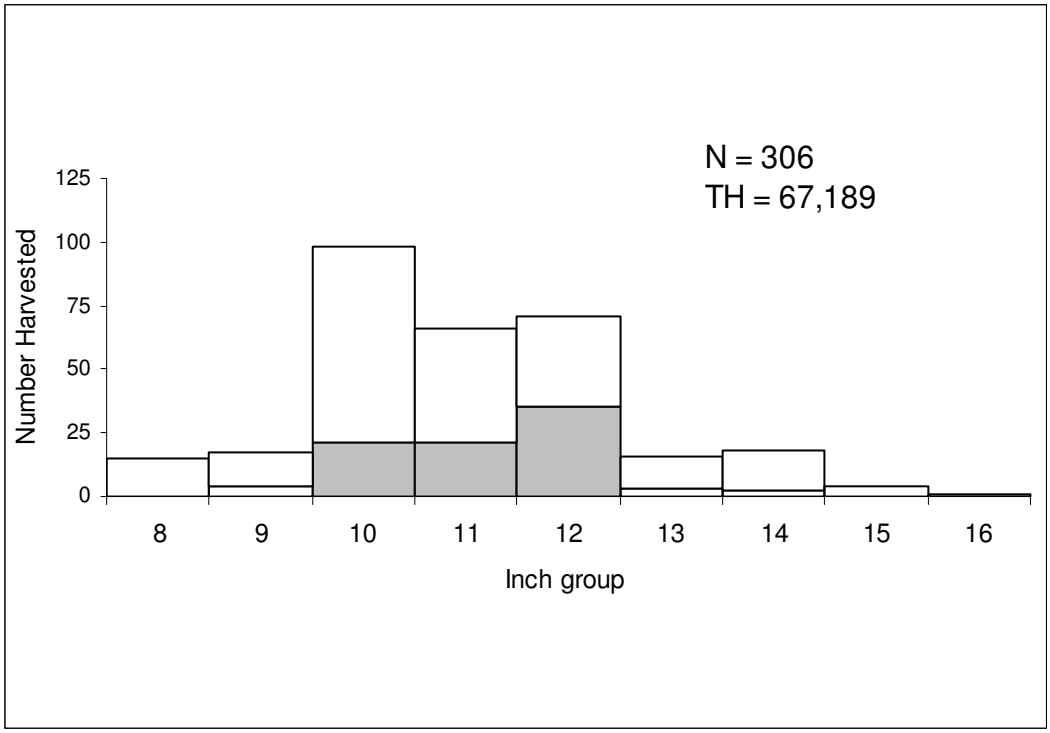


Figure 18. Length frequency of harvested crappies (white = white crappie; grey = black crappie) observed during creel surveys at Toledo Bend Reservoir, Texas, June 2007 through May 2008, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 14. Proposed sampling schedule for Toledo Bend Reservoir, Texas. Gill netting surveys are conducted in the winter, while electrofishing surveys are conducted in the fall and spring. Standard survey denoted by S and additional survey denoted by A.

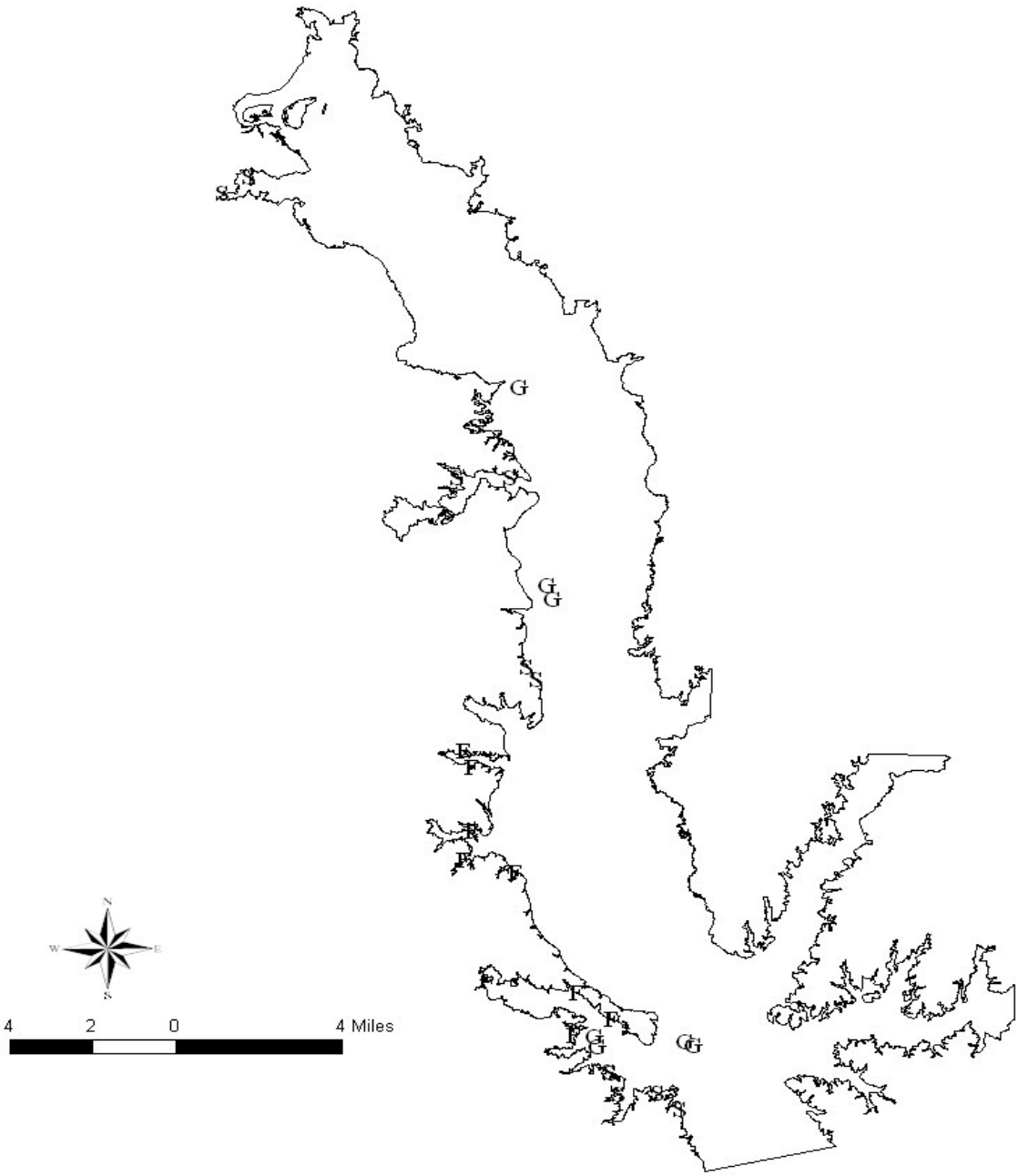
Survey Year	Fall Electrofisher	Spring Electrofisher	Gill Net	Creel Survey	Vegetation	Report
2008-2009	A	A		A	A	
2009-2010	A	A	A	A	A	A
2010-2011	A	A		A	A	
2011-2012	S	A	S	A	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Toledo Bend Reservoir, Texas, 2007 to 2008.

Species	Gill Netting		Fall Electrofishing	
	N	CPUE	N	CPUE
Gizzard shad			202	101.0
Threadfin shad			192	96.0
Blue catfish	105	7.0		
Channel catfish	39	2.6		
White bass	17	1.1		
Yellow bass	102	6.8		
Striped bass	2	0.1		
Redbreast sunfish			71	35.5
Green sunfish			5	2.5
Warmouth			50	25.0
Bluegill			1,021	510.5
Longear sunfish			160	80.0
Redear sunfish			248	124.0
Spotted sunfish			12	6.0
Bantam sunfish			5	2.5
Spotted bass			18	9.0
Largemouth bass			232	116.0

APPENDIX B



Location of sampling sites, north Toledo Bend Reservoir, Texas, 2007 to 2008. Gill net and spring and fall electrofishing stations are indicated by G, S, and F, respectively. Water level was near full pool at time of sampling.

APPENDIX B

Location of sampling sites, south Toledo Bend Reservoir, Texas, 2007 to 2008. Gill net and spring and fall electrofishing by G, S, and F, respectively. Water level was near full pool at time of sampling.

APPENDIX C

Results from team format bass tournaments at Toledo Bend Reservoir, 2004 to 2007. Only tournaments with 5-fish bag limits and > 50 teams were included. Weights are expressed in pounds.

Year	N	1st place weight	2nd place weight	3rd place weight	% total weights > 15 lbs.	% catching limit	Big bass weight
2004	8	21.4	19.0	18.0	6.2	38.4	9.0
2005	5	24.8	18.9	18.1	6.6	44.6	8.5
2006	6	20.9	18.2	17.4	5.4	30.1	8.8
2007	7	23.9	21.7	20.2	12.5	41.8	9.2