

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-221-M-2

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2011 Survey Report

Toledo Bend Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Toledo Bend Reservoir were surveyed in 2012 using electrofishing and gill netting. Anglers were surveyed from June to August 2011 and March to May 2012 with a creel survey. This report summarizes the results of the surveys and contains a management plan for Texas side of 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. Although water level fluctuations average 5 feet annually, the historic low level was reached in 2011 (12 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, 65 to 80% of annual angling effort is directed at black bass. Approximately 10 to 20% of anglers target crappie. With the exception of 2006, TPWD has stocked Florida largemouth bass (FLMB) annually since 1990 to increase abundance of large bass (> 8 pounds). The Louisiana Department of Wildlife and Fisheries (LDWF) also stocks Florida largemouth bass annually. Joint efforts with LDWF have resulted in standardization of all recreational harvest regulations. In 1998, giant salvinia was discovered in Toledo Bend Reservoir. In 2008, plant coverage reached the historic high (4,091 acres) and impeded angler access. Cold winter water temperatures in 2010 and low water levels in 2011 reduced overall coverage to only trace amounts, but plants were scattered throughout the entire reservoir. 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:** Blue catfish abundance was high and stable compared to previous years, and high numbers of fish 12 to 30 inches were available to anglers. Channel catfish numbers were variable with a majority of fish < 12 inches. Angling catch rate averaged 4.0/h. Blue catfish and flathead catfish provided trophy opportunities for anglers.
 - **Temperate basses:** Striped bass were present in the reservoir in low numbers. In 2012, white bass numbers increased. Few anglers target white bass in the reservoir, but during the spawning season (January – March) the fishery is popular in the Sabine River above the reservoir. A total of 4,544 white bass and yellow bass were harvested from the reservoir.
 - **Black basses:** Spotted bass were present in low numbers. Largemouth bass abundance was relatively high; size structure and fish condition were good. The black bass fishery was most popular (67.3% of total fishing effort). Angling catch rate was high (1.2/h).
 - **Crappie:** White crappie and black crappie were present in the reservoir. Angling catch (2.8/h) and total harvest (73,092 fish) reflected an abundant crappie population.
- **Management strategies:** Stock FLMB annually to improve large fish abundance. Monitor largemouth bass population annually with electrofishing and biennially with creel surveys. Continue tournament-monitoring program and supplemental creel questions to monitor large fish abundance. Monitor giant salvinia coverage annually to monitor effects of control measures. Publish monthly articles in the *Lakecaster* highlighting TPWD activities.

INTRODUCTION

This document is a summary of fisheries data collected from the Texas side of Toledo Bend Reservoir in 2011 and 2012. 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 2011 and 2012 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 fluctuation averages 5 feet annually, but the historic low water level was observed in 2011 (159.6 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 2008). 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) (Table 4) 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 and Ashe 2010) included:

1. Stock Florida largemouth bass (FLMB) annually ($\geq 500,000$ fingerlings) to maintain and improve large fish abundance.
Action: FLMB were stocked in 2010 and 2011.
2. Conduct annual electrofishing (fall and spring) and biennial creel surveys to monitor status of largemouth bass population and examine growth every four years.
Action: Spring electrofishing surveys were conducted in 2011 and 2012. Fall electrofishing was conducted in 2010, but the 2011 survey was cancelled due to unsafe conditions related to low lake levels and submerged timber. Largemouth bass growth was examined in 2011.
3. Continue black bass tournament-monitoring program to increase information on relative abundance of large fish (> 20 inches).
Action: Since 2009, data from 38 tournaments have been included and summarized in Appendix C.
4. In conjunction with LDWF, standardize recreational harvest regulations for crappies and catfishes.
Action: In 2011, TPWD and LDWF regulations were standardized for crappies and catfishes.
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 4,091 acres in 2008 (Table 4). Herbicide treatments have targeted access points to maintain angler access and reduce potential transfer to other waters. High emphasis has been placed on public education via media events, press releases, and signage at all public Toledo Bend-Texas boat ramps. As of 2005, Texas law requires removal of all plant

material before leaving a water body. Reservoir-wide management and control options discussed with SRA included boom placement at boat ramps to contain trailer introductions and prevent plant transfer, 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 2010 and 2012. Growth was examined in 2012.

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: Due to bag/length limit standardization efforts with LDWF, no sport fish in Toledo Bend Reservoir are managed with TPWD statewide regulations (Table 2). In 2011, recreational harvest regulations for Texas and Louisiana were standardized for crappies (no minimum length limit, 25-fish daily bag limit), blue and channel catfish (no minimum length limit, 50-fish bag limit in aggregate, no more than 5 fish \geq 20 inches in length may be retained daily), and flathead catfish (18-inch minimum length limit, 10-fish daily bag limit). With these changes, all sport fish regulations are standardized reservoir-wide.

Stocking history: Since 1990, Toledo Bend Reservoir has received annual stockings of FLMB (only exception was 2006) (Table 3). From 2000 to 2008, FLMB were stocked in a 5,000-acre embayment (Housen Bayou – 100 fingerlings/acre) to maximize stocking influence. Beginning in 2009, FLMB were stocked throughout the Texas side of the reservoir. From 1992 to 2009, striped bass were 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 2006, hydrilla has ranged from 3,890 acres (2010) to 10,081 acres (2011) (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).

Water transfer: The annual water yield from Toledo Bend Reservoir is 2,086,600 acre-feet, of which half is allocated to SRA-Texas and half to SRA-Louisiana (collectively the SRAs). Of the 1,043,300 acre-feet/year allocated to SRA-Texas, a water right exists for 750,000 acre-feet/year. In 2003, SRA-Texas applied for the unpermitted 293,300 acre feet. The SRAs operate the Toledo Bend Project primarily for purposes of water supply and conservation, and secondarily for renewable hydropower production and recreation. Hydroelectric power production is for Entergy Gulf States, Inc, CLECO Power, LLC, and Entergy Louisiana, LLC, and major direct water sales are to the cities of Hemphill and Huxley and two industrial companies (Tenaska and XTO). In 2003, SRA-Texas agreed to examine the feasibility of inter-basin transfer of water to north Texas (i.e., Dallas Water Utilities, Tarrant Regional Water District and North Texas Municipal Water District). The development of this pipeline project is projected for 2060 (Texas Water Development Board 2012).

METHODS

Fishes were collected by electrofishing (2 hours at 24, 5-min stations during 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 on the Texas side of the reservoir and all surveys were conducted according to the Fishery Assessment Procedures (TPWD,

Inland Fisheries Division, unpublished manual revised 2011).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and condition indices [relative weights (W_r)] 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 ($RSE = 100 \times SE$ of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Water level data were obtained from the USGS website.

A roving creel survey (18 days; 9 days during summer and spring quarters) was conducted from June 2011 to August 2011 and March 2012 to May 2012 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Fall and winter creel quarters were cancelled due to unsafe conditions related to low lake levels and submerged timber. Total angler catch of largemouth bass ≥ 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 of the entire reservoir was conducted in 2011 by airplane. Coverages were calculated for all prevalent species.

Results of largemouth bass tournaments collected to supplement population information 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 2011, reservoir-wide coverage of beneficial vegetation (hydrilla and American lotus) was 6% of the surface area and similar to previous years (Table 4). Although giant salvinia coverage exceeded 2,000 from 2006 to 2009, cold water temperatures ($< 10^\circ\text{C}$) during the winter of 2010 and low water levels during 2011 (Figure 1) significantly reduced plant abundance.

Creel: Similar to previous survey years, fishing effort on the Texas side of Toledo Bend Reservoir was primarily directed at black basses (67.3%) and crappies (21.7 %) (Table 5). For the summer and spring creel quarters, total fishing effort and total directed expenditures were 141,767 h and \$1,665,630, respectively (Table 6).

Prey species: Primary prey species included gizzard shad, threadfin shad, and bluegill. All three species provided abundant prey. Gizzard shad catch rates increased in 2010, and IOV was 56 (Figure 2). Historically, threadfin shad catch rates have been highly variable (mean = 295.8/h; SD = 560.8) and likely not reflective of population status. The catch rate in 2010 was 2,767.6/h. Bluegill catch rates also increased considerably in 2010 (626.2/h) (Figure 3). Few anglers sought sunfish (2.7% of total fishing effort) (Table 5), but they were frequently harvested by anglers seeking other species (Table 7).

Catfish: Blue catfish catch rates were relatively high and similar in 2010 (11.9/nn) and 2012 (10.7/nn) (Figure 5). Fish > 30 inches were caught in each of the last three survey years. Fish were in good condition as W_r ranged from 82 to 118, indicating adequate prey availability. Average age of 12-inch blue catfish (11.5 - 12.5 inches) was 4.0 years ($N = 13$; range = 3 – 5 years).

Catch rates of channel catfish have varied during the last three survey years (2008 = 2.6/nn; 2010 = 8.7/nn; 2012 = 5.8/nn) (Figure 6). Population size structure was dominated by smaller fish (PSD range = 6 to 21). Average age of 12-inch channel catfish (11.5 - 12.5 inches) was 4.1 years ($N = 10$; range = 4 – 5 years).

Catfish anglers (rod and reel only) accounted for 2.5% of the total fishing effort (Table 5) and catch rate was high (4.0/h) (Table 8). Total estimated harvest was 5,280 fish; 79% of harvested fish were channel catfish (Figure 8). Anecdotal information indicated that blue and flathead catfish provided a substantial passive gear fishery.

Temperate basses: Historically, gill net catch rates of white bass have averaged 1.8/nn, reflecting a low-density population in the reservoir. During the last three survey years, catch rates ranged from 0.3 to 3.6/nn (Figure 9). In 2011/2012, little directed fishing effort was observed on the Texas side of the reservoir (Table 5), and estimated harvest was 1,575 fish (Figure 10). However, during the spawning season (January – March) a popular fishery exists in the Sabine River upstream of the reservoir.

Since the 1970s, striped bass were stocked annually by the LDWF to support broodfish procurement for palmetto bass production. However, no fish have been stocked since 2009. During the last three survey years, no fish were caught with gill nets and no anglers targeted striped bass (Table 5). During 2011/2012, no angler harvest was observed.

Yellow bass were abundant in the reservoir and comprised 65% of temperate bass harvest (2,969 fish; Figure 11).

Black bass: Spotted bass were present in the reservoir, but few were collected by electrofishing (Figure 12). Approximately 1,100 fish were harvested in 2011/2012 (Figure 15).

Fall electrofishing catch rates during 2008 to 2010 reflected relatively high and stable largemouth bass abundance (range = 133.5 to 223.1/h; Figure 13). Population size structure was similar across years (PSD range = 39 to 58; PSD-14 range = 20 to 27). In 2010, relative weights ranged from 88 to 109, indicating largemouth bass were in good condition. Growth of largemouth bass was adequate; average age at 14 inches (13.5 - 14.5 inches) was 2.9 years (N = 13; range = 1 – 4 years).

Similarly, spring electrofishing catch rates were also relatively high (range = 124.5 to 245.5/h) (Figure 14). However, spring surveys reflected higher proportions of larger fish (PSD range = 56 to 70; PSD-14 range = 23 to 39).

Although the reservoir has been stocked with FLMB annually since 1990 (only exception in 2006) (Table 3), reservoir-wide FLMB influence has remained low and relatively stable. Since 2006, FLMB alleles ranged from 24 to 29% and no pure FLMB were collected (Table 10).

The majority of total fishing effort on the Texas side of Toledo Bend Reservoir (67.3%) was directed at black basses (50.0% was tournament-related) (Table 5). From 2008 to 2012, angler catch rates were relatively high and consistent, exceeding 0.8/h during all three survey periods (Table 9). During 2011/2012, total directed effort and harvest was 95,153 h and 32,771 fish, respectively. Tournament-retained fish comprised 56% of total harvest, which was an increase from previous survey years. In addition, the proportion of legal-size fish immediately released increased to 59%. Total catch of fish \geq 4 pounds was 4,340 fish in 2011-2012 (2.9% of total catch) (Table 9).

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). Since 2009, results 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 47.7 to 55.9%, while the proportion of individual anglers ranged from 26.1 to 70.2%. Winning weights ranged from 24.9 to 27.1 pounds for team events and 19.2 to 22.5 pounds for individual events. The proportion of teams with weights > 15 pounds was similar (18.5 – 23.2%), while individual events were more variable (5.2 to 22.4%). Across years for all tournaments, average big bass weight ranged from 7.7 to 9.3 pounds.

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 productive crappie fishery that was second to the black bass fishery in terms of total fishing effort (21.7%; Table 5). Angler catch rate was high (2.8/h; Table 11) and total harvest was 73,092 fish (67% black crappie) (Table 11; Figure 17).

Fisheries management plan for Toledo Bend Reservoir, Texas

Prepared – July 2011

ISSUE 1: Creel surveys indicate most sportfishing effort on the Texas side of Toledo Bend Reservoir is for largemouth bass. The reservoir also hosts a considerable number of annual bass tournaments (50% of black bass effort). Tournament-monitoring and creel data reflect angler catch of large fish (> 8 pounds) and the reservoir has produced four ShareLunkers (latest in 2012).

MANAGEMENT STRATEGIES

1. Continue annual stocking of FLMB (500,000 fingerlings) to maintain and improve large fish numbers.
2. Continue the tournament-monitoring program to increase information on legal-size fish.
3. Conduct annual electrofishing and biennial creel surveys to monitor status of the 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 4,000 acres and impeded angler access. Transport to other waters is likely.

MANAGEMENT STRATEGIES

1. The TPWD Aquatic Habitat Enhancement (AHE) office has taken the lead role with management of giant salvinia. Assist AHE staff with implementation of management strategies.
2. Monitor giant salvinia coverage annually via airplane to document plant distribution and effects of control measures (i.e., herbicides, booms, weevils).
3. Continue to oversee herbicide treatments by private contractors.
4. At access points, maintain all educational signs and continue herbicide treatments to prevent transport to other waters.
5. In cooperation with TPWD Communications Division, continue educational campaign via media releases, signage, and informational booths at public events.
6. Continue discussions with SRA regarding containment boom funding and placement to increase herbicide efficiency and reduce transport potential, and water level drawdowns to decrease plant coverage.
7. Continue to investigate effects of salvinia weevil releases.
8. Continue to communicate with LDWF regarding plant distribution and control measures.

ISSUE 3: As part of the reservoir-wide standardization of sportfish harvest regulations in 2011, blue and channel catfish regulations were changed to a no minimum length limit, 50-fish daily bag in aggregate, with only 5 blue or channel catfish > 20 inches retained each day. A considerable number of passive gear anglers have expressed discontent with the current harvest restriction of fish > 20 inches, as a majority of their catch exceeds this length.

MANAGEMENT STRATEGY

1. Collect catch and harvest data from passive gear catfish anglers to determine length-frequency of catch, proportion of catch > 20 inches in length, and the most appropriate length at which to restrict harvest. Solicit angler opinion regarding a potential change of the harvestable length.

ISSUE 4: The crappie fishery at Toledo Bend Reservoir is significant (22% of the total annual fishing effort).

MANAGEMENT STRATEGY

1. Conduct biennial 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 biennial creel surveys to closely monitor the popular largemouth bass fishery (Table 13). Biennial 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.

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Quarterly Water Level

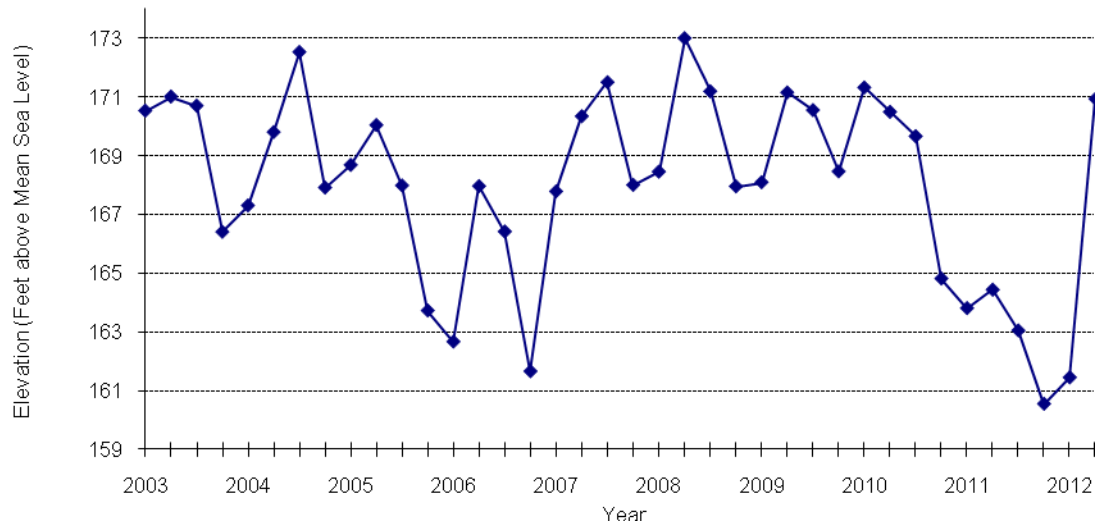


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Toledo Bend Reservoir, Texas.

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)	21.2
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	50 (in any combination)	No Limit - No Limit ^a
Catfish, flathead	10	18 – No Limit
Bass, white	25	No Limit – No Limit
Bass, striped	5	No Limit – No Limit ^b
Bass, largemouth	8 ^c	14 – No Limit
Bass, spotted	8 ^c	No Limit - No Limit
Crappie, white and black crappie	25 (in any combination)	No Limit – No Limit

^aOnly 5 blue or channel catfish > 20 inches may be retained each day.

^bOnly 2 striped bass \geq 30 inches may be retained each day.

^cBag limit for spotted and largemouth bass is 8 in the aggregate.

Table 3. Stocking history of Toledo Bend Reservoir, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

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
	2008	512,768	FGL	1.7
	2009	860,614	FGL	1.6
	2010	509,034	FGL	1.5
	2011	499,321	FGL	1.6
	Total	14,114,102		
Largemouth bass	1967	1,689,700	FRY	0.7
	1967	284,300	UNK	UNK
	1987	305	AFGL	6.0

Species	Year	Number	Life Stage	Mean TL (in)
	1987	22,900	FGL	3.0
	Total	1,997,205		
Paddlefish	1992	106,234		7.1
	1995	15,334		2.2
	Total	121,568		
ShareLunker largemouth bass	2006	4,592	FGL	1.8
	2008	2,604	FGL	1.5
	Total	7,196		
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, September 2006 to 2011. Reservoir-wide acreage (both Texas and Louisiana) of each species and percent of total surface area coverage (in parentheses) are presented.

Species	2006	2007	2008	2009	2010	2011
American lotus	725 (<1)	834 (<1)	1,729 (1)	838 (<1)	200 (<1)	19 (<1)
Giant salvinia	2,002 (1)	2,555 (2)	4,091 (3)	2,555 (2)	31 (<1)	Trace
Hydrilla	4,477 (3)	6,334(4)	4,373 (3)	8,544 (5)	3,890 (2)	10,081 (6)
<i>Potamogeton spp.</i>	19 (<1)	379 (<1)	432 (<1)	343 (<1)	Trace	
Water hyacinth	Trace	1,525 (1)	2,822 (2)	78 (<1)	Trace	

Table 5. Percent directed angler effort by species for Toledo Bend Reservoir, Texas, 2008 to 2012. For black basses, proportions of tournament-angler effort are in parentheses. For 2011/2012, only the summer and winter quarters were sampled.

Species	Year		
	2008/2009	2009/2010	2011/2012*
Catfishes	2.6	2.1	2.5
White bass	0.0	0.0	1.6
Yellow bass	0.0	0.0	0.8
Temperate basses	0.5	0.8	0.2
Sunfishes	4.0	1.6	2.7
Black basses	70.3 (32.2)	76.3 (32.3)	67.3 (50.0)
Crappies	21.8	14.4	21.7
Anything	0.8	4.8	3.2

*2011/2012 survey only included summer and winter quarters

Table 6. Total fishing effort (h) for all species and total directed expenditures at Toledo Bend Reservoir, Texas, 2008 to 2012. For 2011/2012, only the summer and winter quarters were sampled.

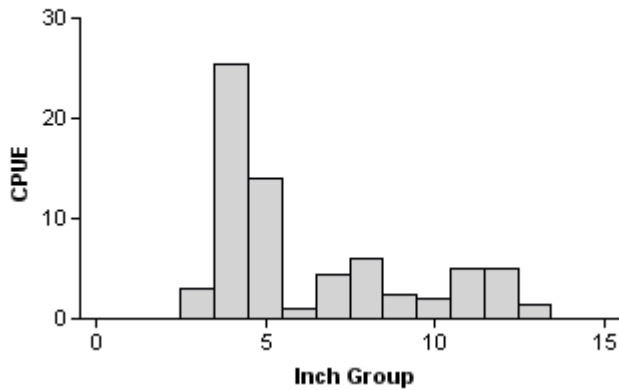
Creel Statistic	Year		
	2008/2009	2009/2010	2011/2012*
Total fishing effort	391,915	476,589	141,767
Total directed expenditures	\$3,201,459	\$3,322,820	\$1,665,630

*2011/2012 survey only included summer and winter quarters

Gizzard Shad

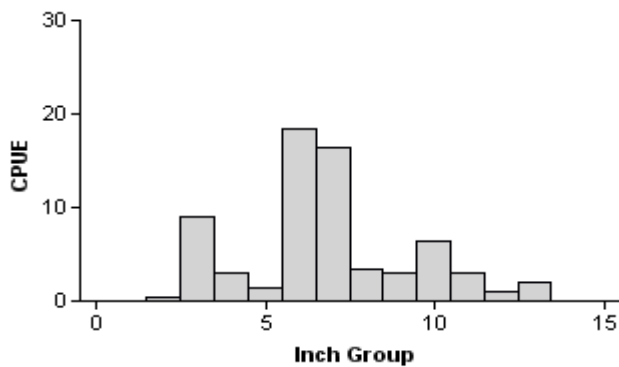
2008

Effort = 2.0
Total CPUE = 70.0 (23; 140)
IOV = 69 (6.6)



2009

Effort = 2.0
Total CPUE = 68.0 (28; 136)
IOV = 72 (8.7)



2010

Effort = 1.8
Total CPUE = 98.2 (29; 180)
IOV = 56 (10.2)

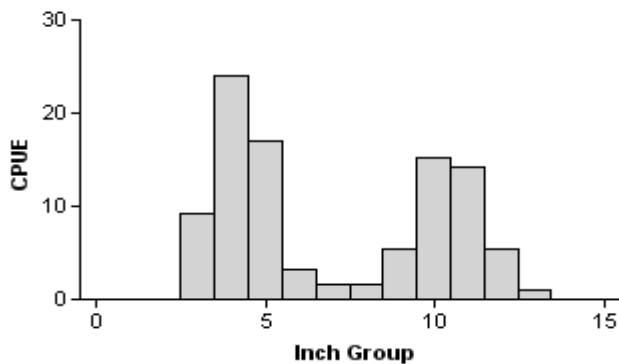
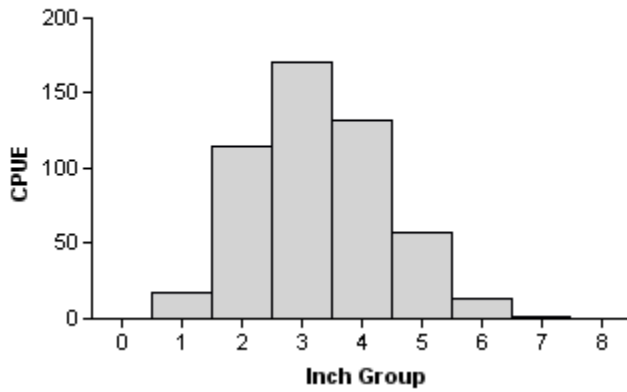


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2008, 2009, and 2010.

Bluegill

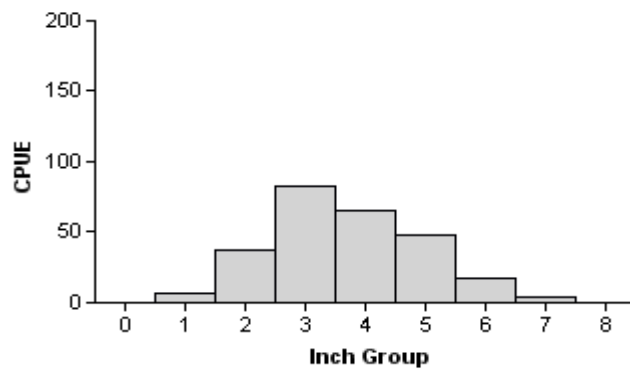
2008

Effort = 2.0
Total CPUE = 507.0 (16; 1014)
PSD = 4 (1.1)



2009

Effort = 2.0
Total CPUE = 261.5 (23; 523)
PSD = 10 (3.3)



2010

Effort = 1.8
Total CPUE = 626.2 (23; 1148)
PSD = 5 (1.3)

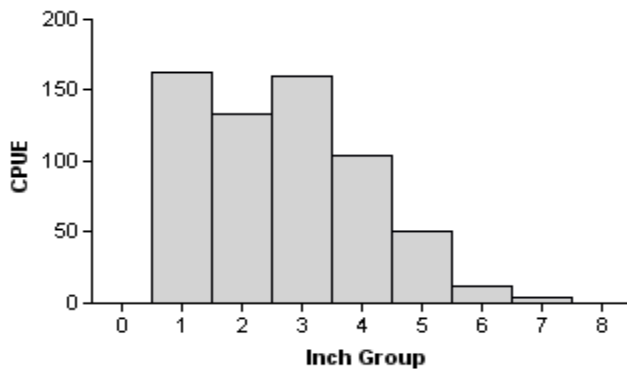


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2008, 2009, and 2010.

Sunfishes

Table 7. Creel survey statistics for sunfishes at Toledo Bend Reservoir, Texas from June 2008 through May 2009, June 2009 through May 2010, and June through August 2011/March through May 2012, 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		
	2008-2009	2009-2010	2011-2012*
Directed effort (h)	15,575 (32)	7,799 (45)	3,886 (38)
Directed effort/acre	0.22 (32)	0.11 (45)	0.05 (38)
Total catch per hour	2.90 (51)	4.22 (55)	5.68 (48)
Total harvest	59,688 (21)	28,498 (83)	19,126 (14)
Harvest/acre	0.84 (21)	0.40 (83)	0.27 (14)
Percent legal released	17	66	65

*2011/2012 survey only included summer and winter quarters

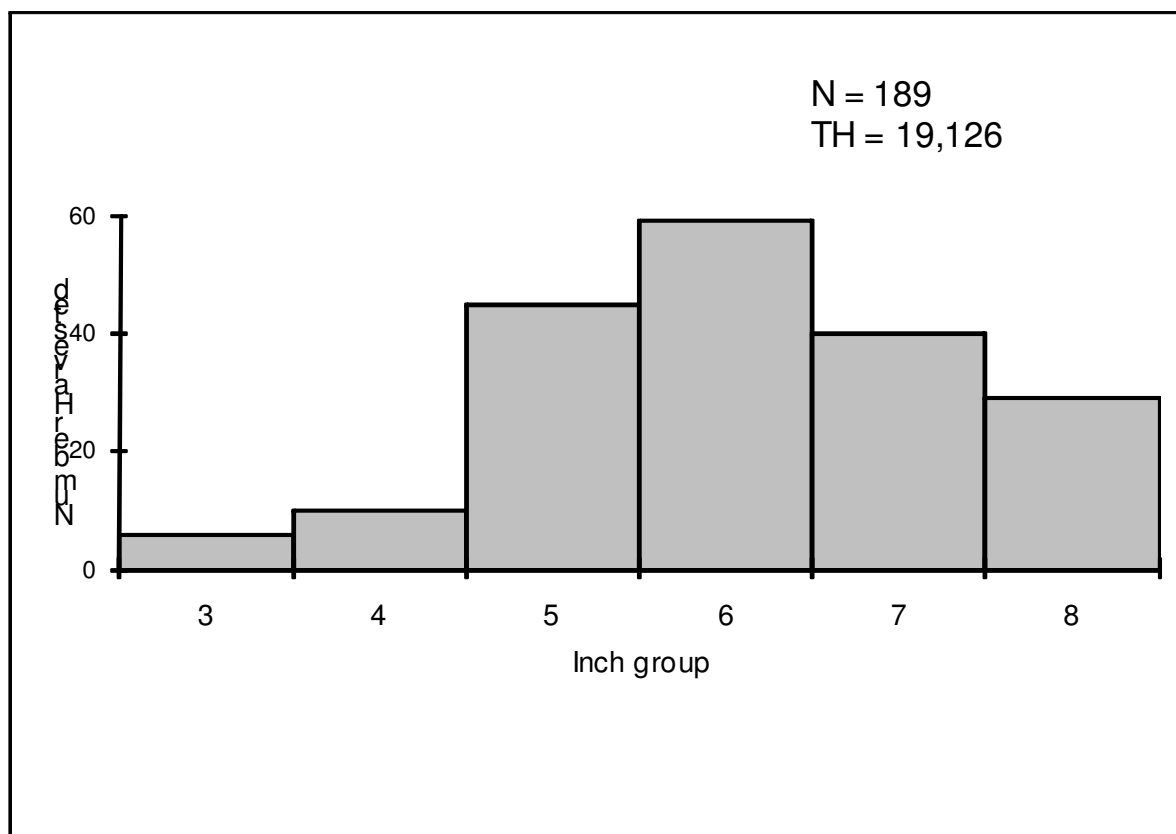
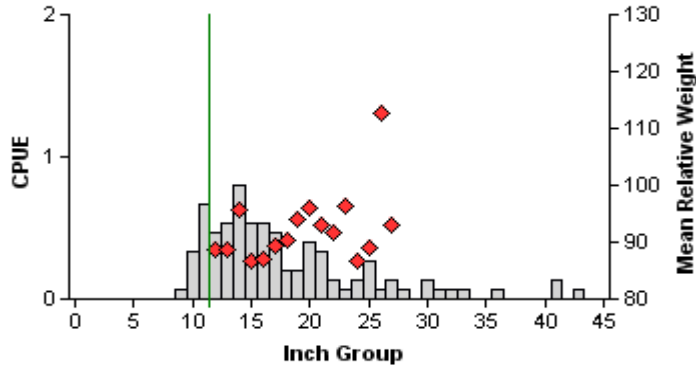


Figure 4. Length frequency of harvested bluegill observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested bluegill observed during creel surveys, and TH is the total estimated harvest for the creel period.

Blue Catfish

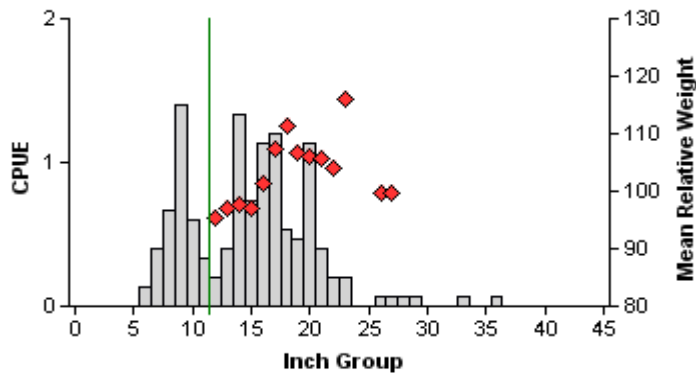
2008

Effort = 15.0
Total CPUE = 7.0 (31; 105)
PSD = 37 (10.5)



2010

Effort = 15.0
Total CPUE = 11.9 (20; 178)
PSD = 28 (4.6)



2012

Effort = 15.0
Total CPUE = 10.7 (46; 161)
PSD = 42 (9.3)

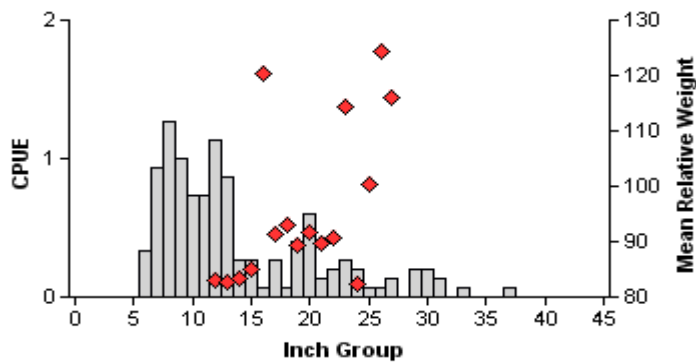
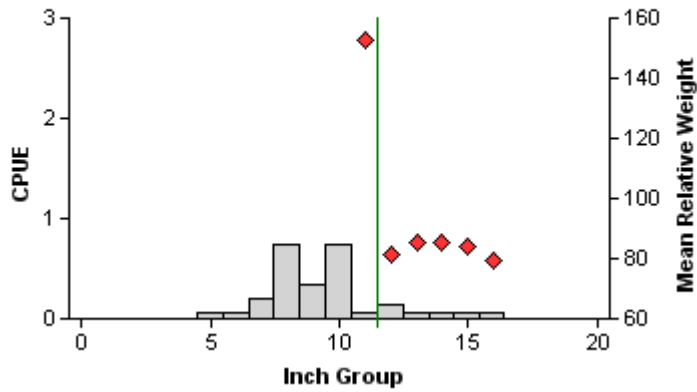


Figure 5. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2008, 2010, and 2012. Vertical lines indicate minimum length limit.

Channel Catfish

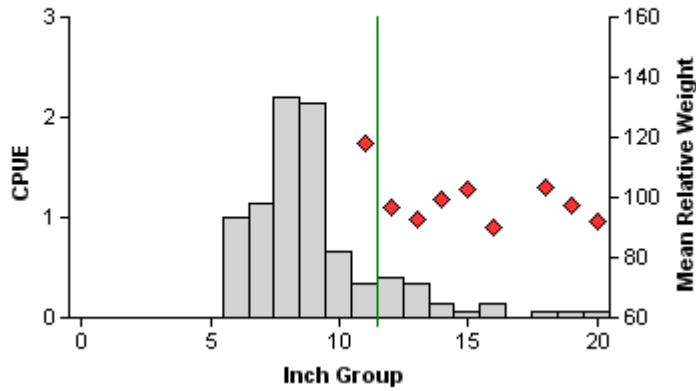
2008

Effort = 15.0
Total CPUE = 2.6 (38; 39)
PSD = 14 (14)



2010

Effort = 15.0
Total CPUE = 8.7 (37; 131)
PSD = 21 (6.1)



2012

Effort = 15.0
Total CPUE = 5.8 (42; 87)
PSD = 6 (6.1)

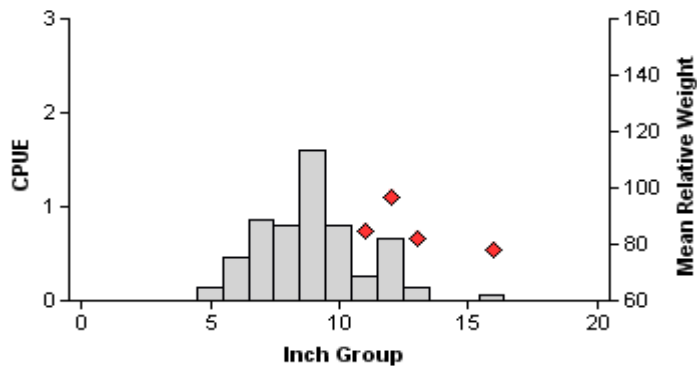


Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2008, 2010, and 2012. Vertical lines indicate minimum length limit.

Catfishes

Table 8. Creel survey statistics for catfishes at Toledo Bend Reservoir, Texas from June 2008 through May 2009, June 2009 through May 2010, and June through August 2011/March through May 2012 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		
	2008-2009	2009-2010	2011-2012*
Directed effort (h)	9,985 (34)	9,907 (37)	3,536 (50)
Directed effort/acre	0.14 (34)	0.14 (37)	0.05 (51)
Total catch per hour	0.97 (55)	2.18 (82)	4.02 (47)
Total harvest	8,286 (260)	14,954 (125)	5,280 (180)
Harvest/acre	0.12 (260)	0.21 (125)	0.07 (180)
Percent legal released	4	1	0

*2011/2012 survey only included summer and winter quarters

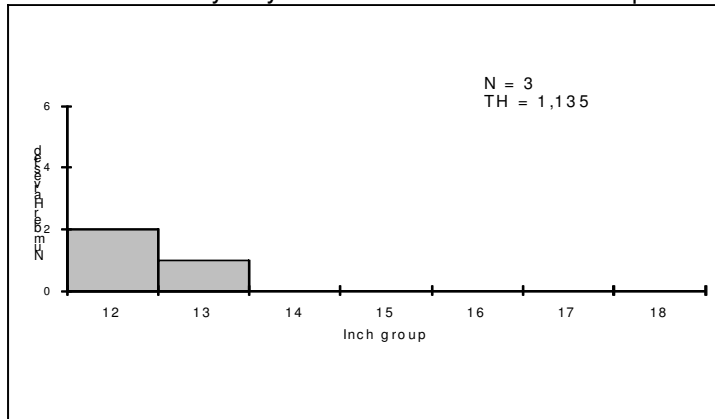


Figure 7. Length frequency of harvested blue catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

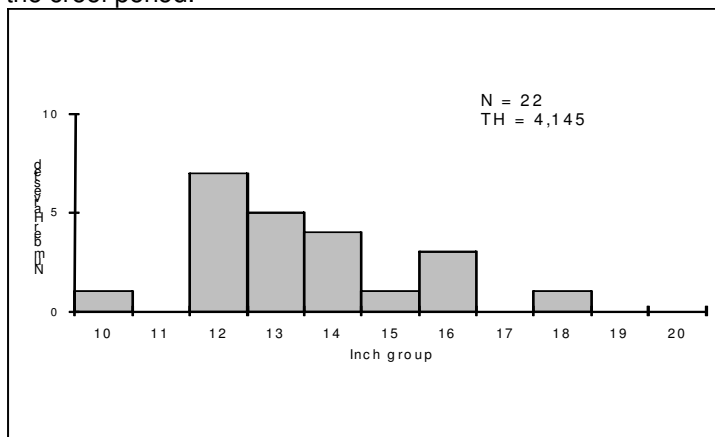


Figure 8. Length frequency of harvested channel catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

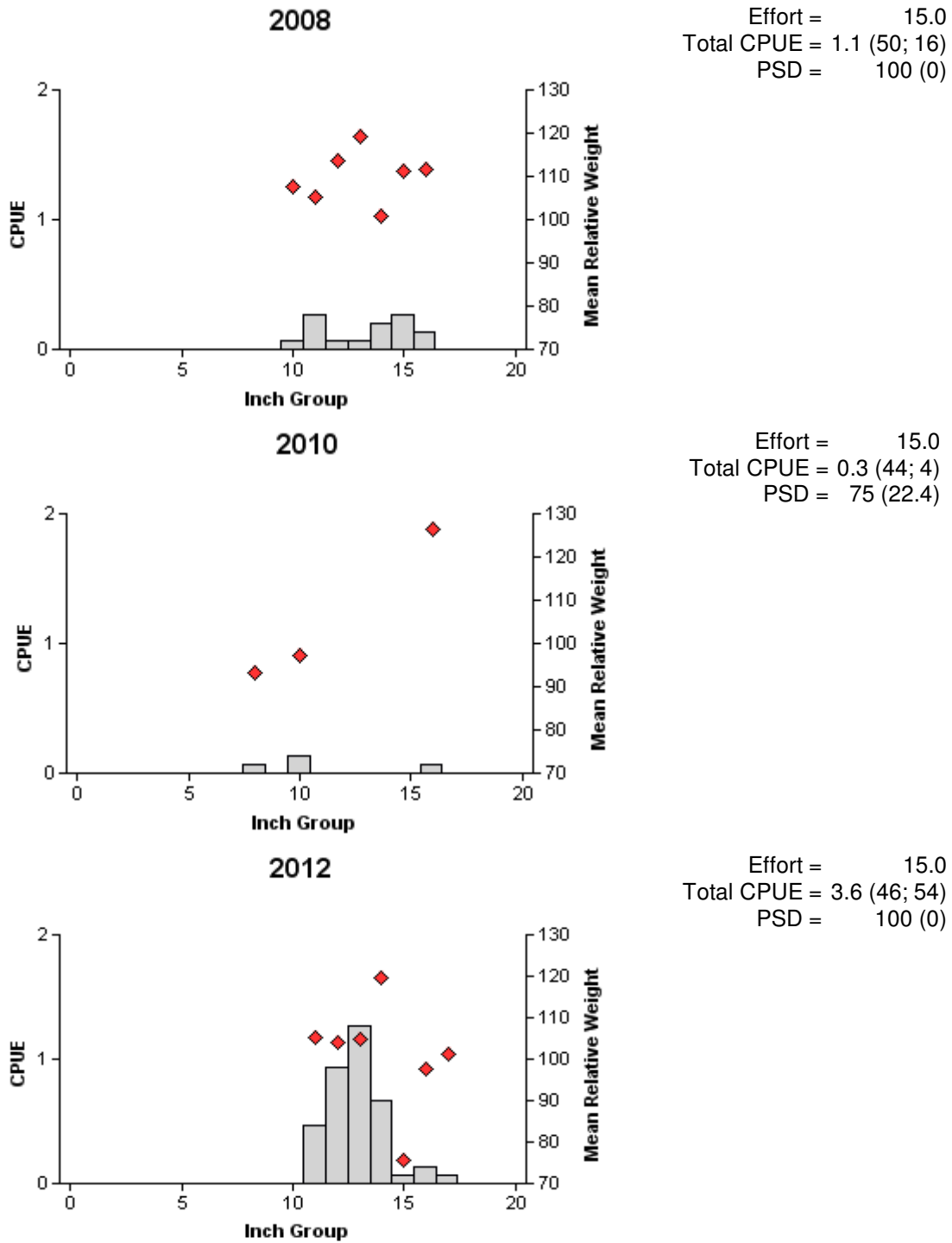


Figure 9. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2008, 2010, and 2012.

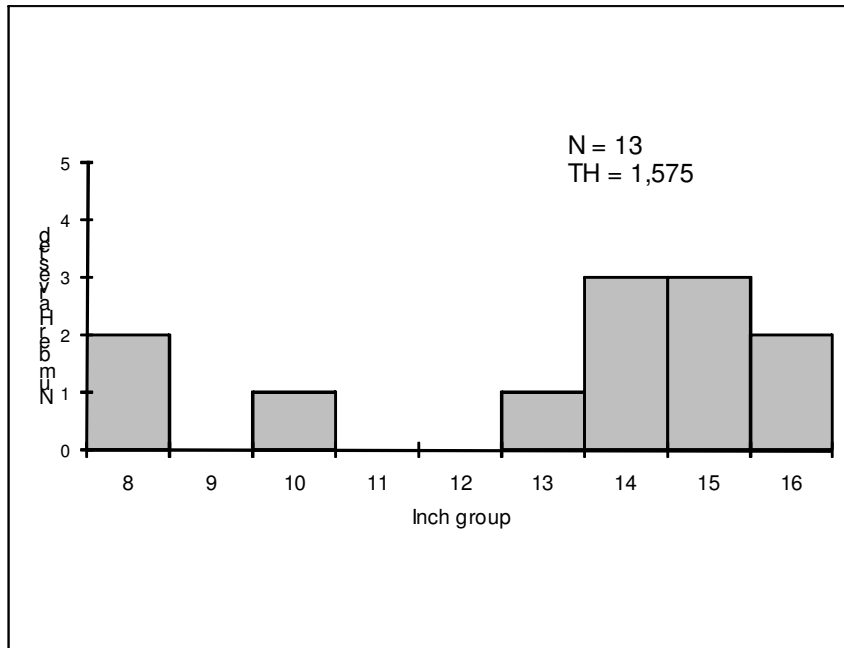


Figure 10. Length frequency of harvested white bass observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested yellow bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

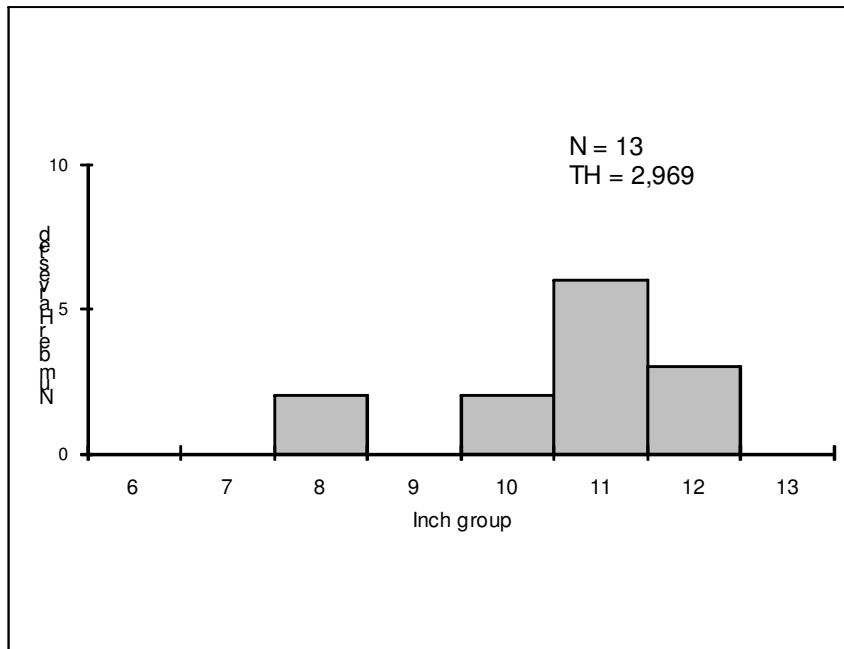


Figure 11. Length frequency of harvested yellow bass observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested yellow bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Spotted Bass

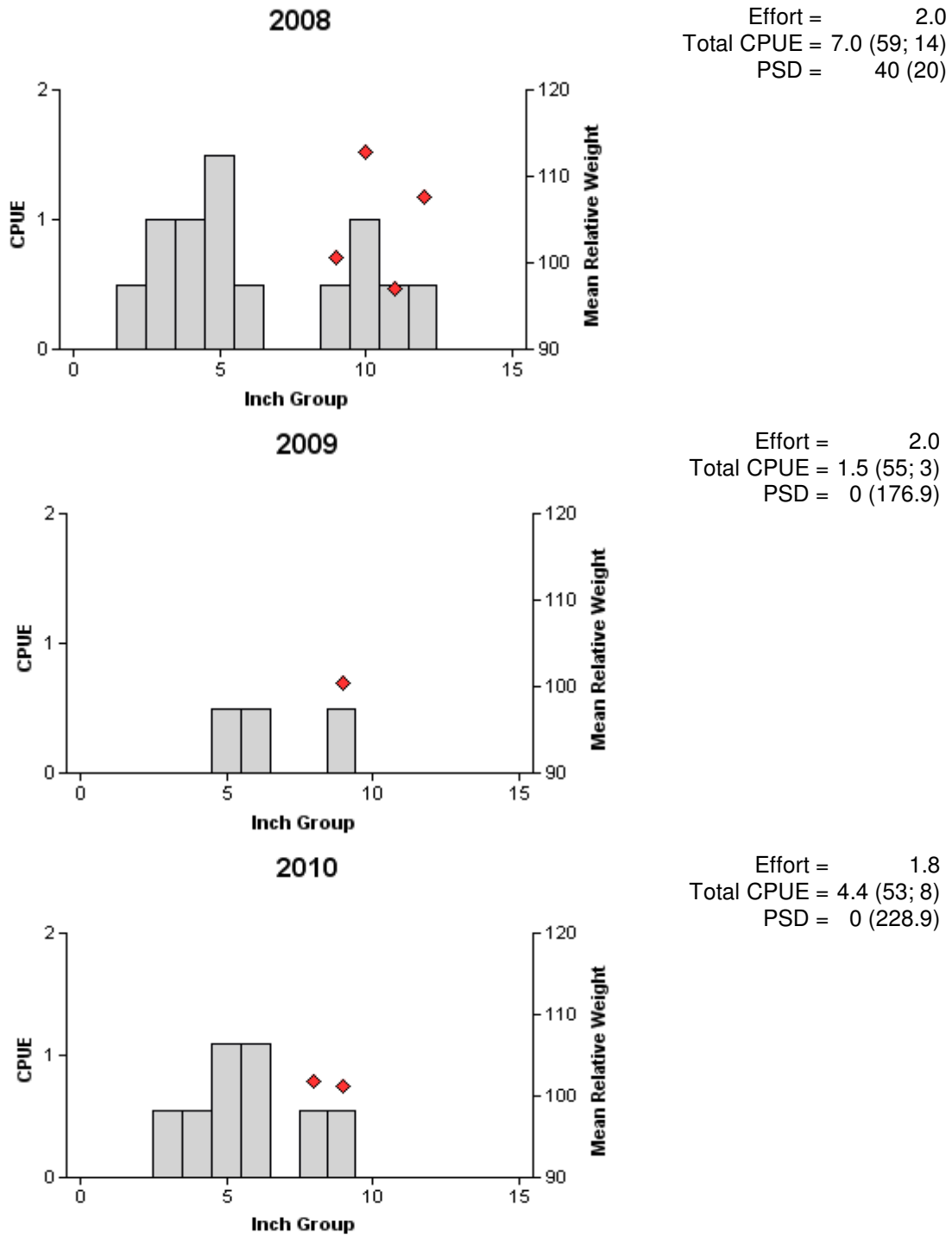
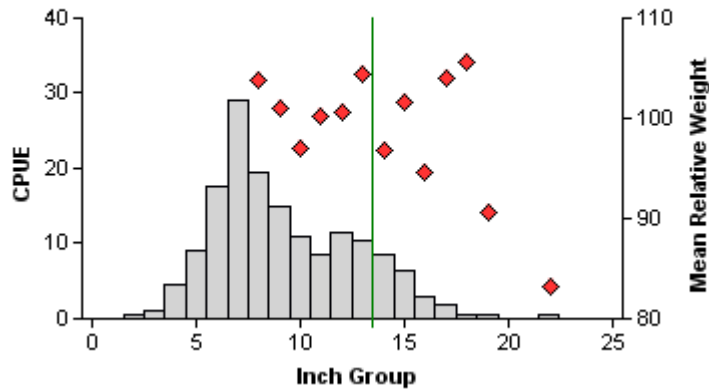


Figure 12. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2008, 2009, and 2010.

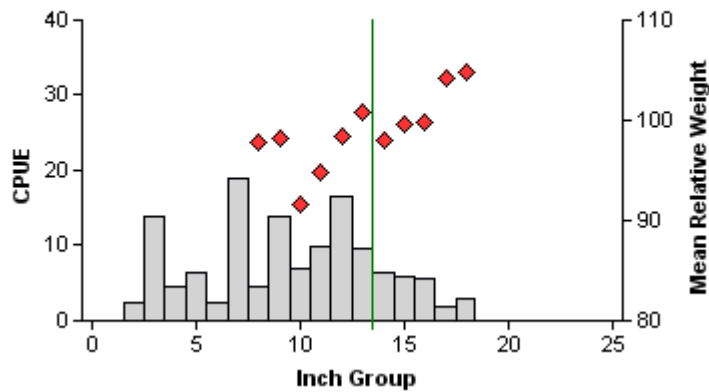
Largemouth Bass

2008



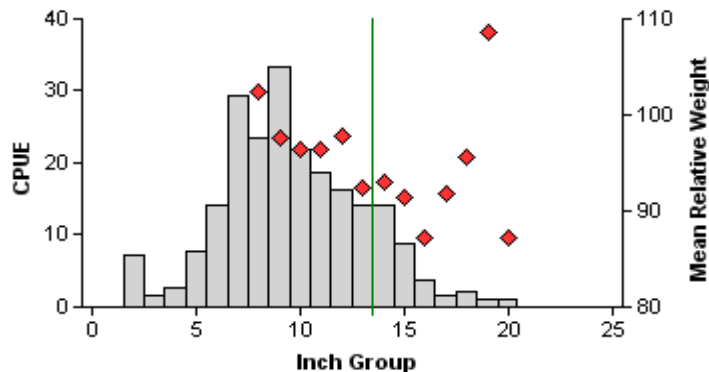
Effort = 2.0
 Total CPUE = 159.0 (15; 318)
 PSD = 45 (2.9)
 PSD-14 = 22 (2.6)

2009



Effort = 2.0
 Total CPUE = 133.5 (14; 267)
 PSD = 58 (4.3)
 PSD-14 = 27 (4.5)

2010

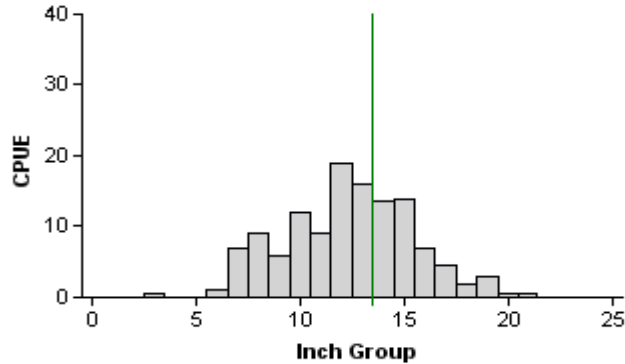


Effort = 1.8
 Total CPUE = 223.1 (14; 409)
 PSD = 39 (3.6)
 PSD-14 = 20 (2.5)

Figure 13. 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, 2008, 2009, and 2010. Vertical lines indicate minimum length limit.

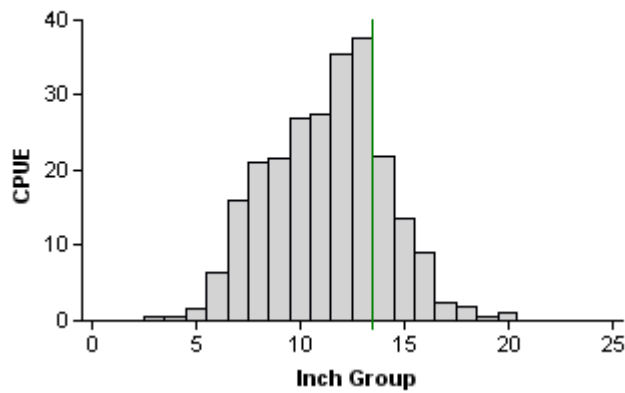
Largemouth Bass

2010



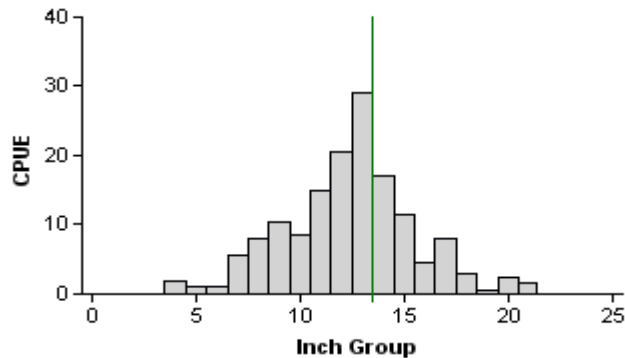
Effort = 2.0
 Total CPUE = 124.5 (13; 249)
 PSD = 69 (4.2)
 PSD-14 = 39 (4.8)

2011



Effort = 2.0
 Total CPUE = 245.5 (12; 491)
 PSD = 56 (2.5)
 PSD-14 = 23 (2)

2012



Effort = 2.0
 Total CPUE = 149.5 (15; 299)
 PSD = 70 (4.2)
 PSD-14 = 35 (3.7)

Figure 14. 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, 2010, 2011, and 2012. Vertical lines indicate minimum length limit.

Black basses

Table 9. Creel survey statistics for black basses at Toledo Bend Reservoir, Texas from June 2008 through May 2009, June 2009 through May 2010, and June through August 2011/March through May 2012 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. For estimated catch of 4, 7, and 10-pound fish, the percentages of total catch are provided.

Creel Survey Statistic	Year		
	2008-2009	2009-2010	2011-2012*
Directed effort (h)	274,935 (24)	363,248 (20)	95,411 (15)
Directed effort/acre	3.87 (24)	5.12 (20)	1.34 (15)
Total catch per hour	0.81 (14)	1.09 (12)	1.19 (15)
Total catch	256,890 (26)	398,094 (18)	151,471 (22)
4 – 6.9 pound fish	1,293 – 0.5%	6,026 – 1.5%	3,922 – 2.6 %
7 – 9.9 pound fish	0	480 – 0.1%	418 - 0.3%
≥ 10 pound fish	0	84 - <0.1%	0
Total harvest	92,996 (45)	132,346 (34)	32,771 (26)
Traditional harvest	58,587	93,966	14,547
Tournament-retained	34,409	38,380	18,224
Percent harvest tournament-retained	37	29	52
Harvest/acre	1.31 (45)	1.86 (34)	0.46 (26)
Percent legal released	18	24	59

*2011/2012 survey only included summer and winter quarters

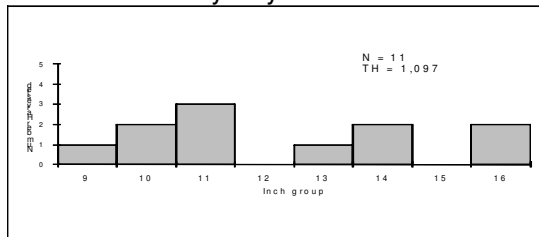


Figure 15. Length frequency of harvested spotted bass observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

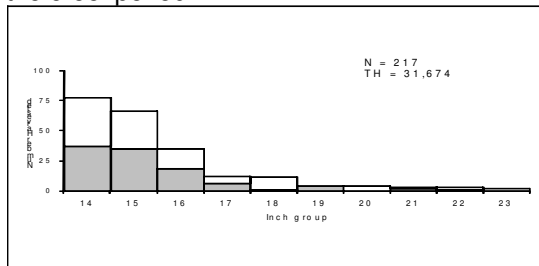


Figure 16. Length frequency of harvested largemouth bass (white = tournament-retained; grey = harvested) observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 10. Results of genetic analysis of largemouth bass collected by fall electrofishing, Toledo Bend Reservoir, Texas, 2006 - 2011. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Fx = first or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype			% FLMB alleles	% pure FLMB
		FLMB	Fx	NLMB		
2006	30	0	20	10	24	0.0
2007	30	0	28	2	29	0.0
2011	30	0	29	1	29	0.0

Crappies

Table 11. Creel survey statistics for crappies at Toledo Bend Reservoir, Texas from June 2008 through May 2009, June 2009 through May 2010, and June through August 2011/March through May 2012 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		
	2008-2009	2009-2010	2011-2012*
Directed effort (h)	85,170 (28)	68,750 (23)	30,795 (18)
Directed effort/acre	1.20 (28)	0.97 (23)	0.44 (18)
Total catch per hour	1.82 (31)	2.61 (23)	2.83 (26)
Total harvest	110,712 (49)	137,403 (27)	73,092 (30)
Harvest/acre	1.56 (49)	1.93 (27)	1.03 (30)
Percent legal released	<1	1	28

*2011/2012 survey only included summer and winter quarters

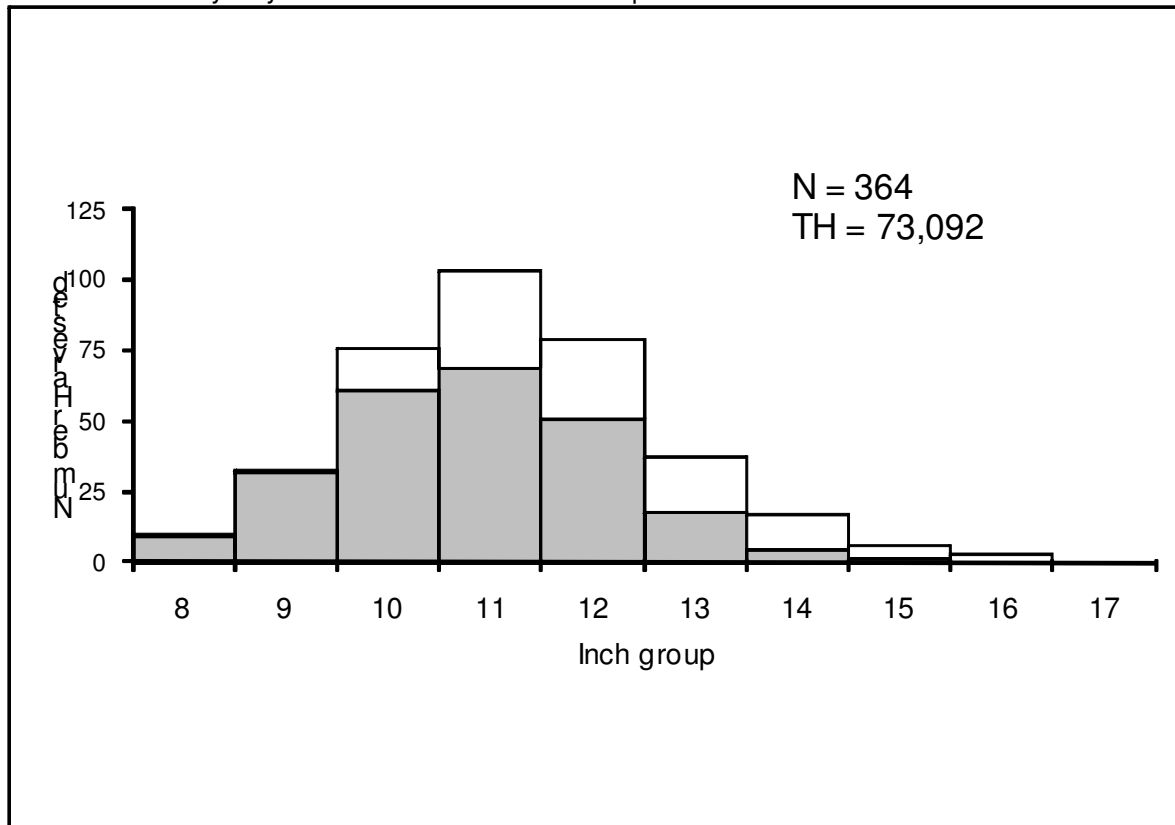


Figure 17. Length frequency of harvested crappies (white = white crappie; grey = black crappie) observed during creel surveys at Toledo Bend Reservoir, Texas, June through August 2011/March through May 2012, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 12. 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.

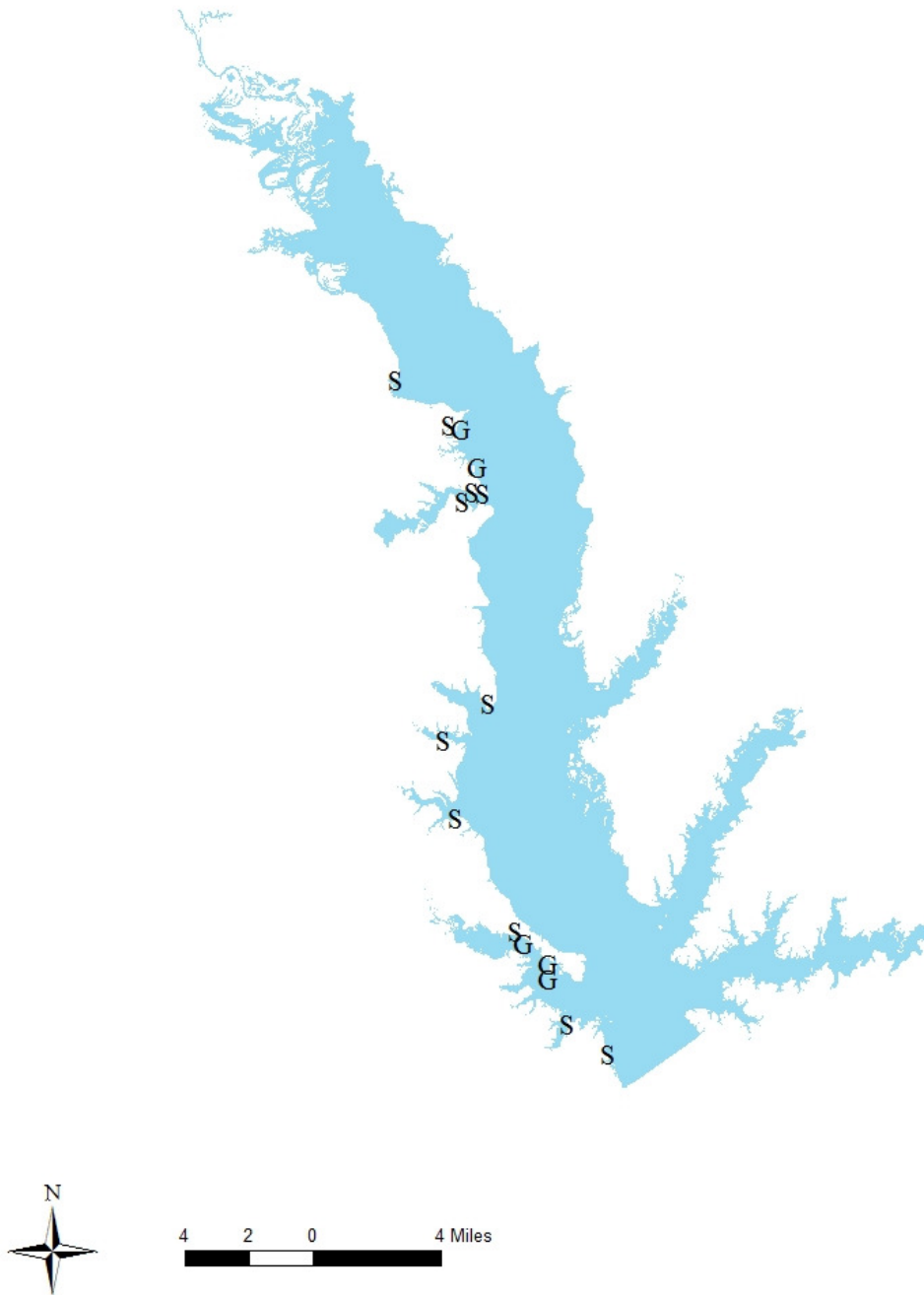
Survey Year	Fall Electrofisher	Spring Electrofisher	Gill Net	Creel	Vegetation	Access	Report
2012 - 2013	A	A			A		
2013 - 2014	A	A	A	A	A		A
2014 - 2015	A	A			A		
2015 - 2016	S	A	S	A	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from gill netting and spring electrofishing, Toledo Bend Reservoir, Texas, 2011 to 2012.

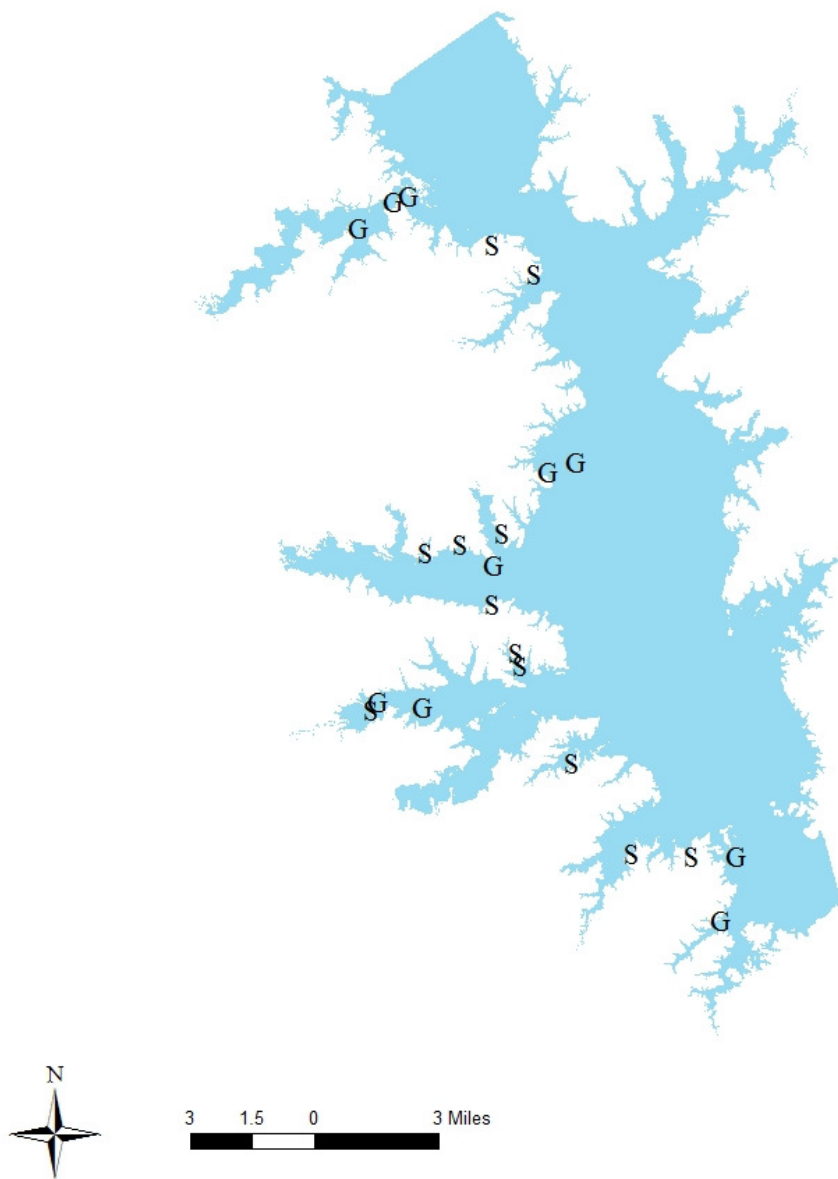
Species	Gill Netting		Spring Electrofishing	
	N	CPUE	N	CPUE
Spotted gar	14	0.9		
Common carp	1	0.1		
Spotted sucker	47	3.1		
Blue catfish	161	10.7		
Channel catfish	87	5.8		
White bass	54	3.6		
Yellow bass	36	2.4		
Largemouth bass			299	149.5

APPENDIX B



Location of sampling sites, north Toledo Bend Reservoir, Texas, 2012. Gill net and spring electrofishing stations are indicated by G and S, respectively. Water level was near full pool during electrofishing, but 10 feet low during gill netting.

APPENDIX B



Location of sampling sites, south Toledo Bend Reservoir, Texas, 2012. Gill net and spring electrofishing stations are indicated by G and S, respectively. Water level was near full pool during electrofishing, but 10 feet low during gill netting.

APPENDIX C

Results from individual and team format bass tournaments at Toledo Bend Reservoir, 2009 to 2011. Only tournaments with 5-fish bag limits and > 50 individuals or teams were included. Weights are expressed in pounds.

Year	N	1 st place weight	2 nd place weight	3 rd place weight	% total weights > 15 lbs.	% catching limit	Big bass weight
Individual							
2009	10	19.2	17.2	15.9	5.2	26.1	7.7
2010	7	22.5	20.5	19.3	22.4	70.2	9.1
2011	4	19.7	18.6	17.6	7.2	35.8	8.0
Team							
2009	5	24.9	23.8	21.5	18.5	47.7	9.3
2010	6	26.9	23.2	21.7	23.2	55.9	9.0
2011	6	27.1	23.7	21.8	22.0	51.7	9.0