PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-35

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

Toledo Bend Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Toledo Bend Reservoir were surveyed in 2009 and 2010 using electrofishing and gill netting. Anglers were surveyed from June 2009 to May 2010 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. Water level fluctuations average 5 feet annually, but reached its 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, 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) 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 2008, plant coverage reached the historic high (4,091acres) and impeded angler access. Cold winter water temperatures in 2010 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:** Abundance of blue catfish has increased over the last three survey years, and high numbers of fish 14 to 22 inches were available to anglers. Channel catfish numbers were variable with a majority of fish < 12 inches. 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 annual harvest was approximately 26,000 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 (76.3% 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 (2.6/h) and total annual harvest (137,404 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 biennially with creel surveys. Continue tournament-monitoring program and supplemental creel questions to more effectively monitor large fish abundance. Monitor giant salvinia coverage annually 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 the Texas side of Toledo Bend Reservoir in 2009 and 2010. 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 2009 and 2010 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 (Figure 1). However, water levels reached its historic low in 2006 (161.3 feet). 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 2008) 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: From 2000 to 2008, FLMB were stocked annually in Housen Bayou embayment. In 2009, embayment stockings were discontinued, and fish were stocked throughout the reservoir.
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 2007 to 2010 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 2005, data from 51 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 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 2008 and 2010. 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). 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. 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 2006, hydrilla has ranged from 4,373 acres (2008) to 8,544 acres (2009) (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 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 2009).

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 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. Water level data were obtained from the SRA website.

A roving creel survey (36 days; 9 days per quarter) was conducted from June 2009 to May 2010 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). 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 of the entire reservoir was conducted in 2009 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 2009, reservoir-wide coverage of beneficial vegetation (hydrilla, American lotus, and *Potamogeton spp.*) was 6% of the surface area and similar to previous years (Table 4). Although giant salvinia coverage has exceeded 2,000 acres since 2006, cold water temperatures (< 10C) during the winter of 2010 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 (76.3%) and crappies (14.4%) (Table 5). Total fishing effort (476,589 h) and total directed expenditures ($3,322,820) increased over the last three survey years (Table 6).

Prey species: Primary prey species included gizzard shad, threadfin shad, and bluegill. All three species provided abundant prey. Although gizzard shad catch rates declined from 2007 to 2009, IOV increased (Figure 2). Historically, threadfin shad catch rates have been highly variable (192.8/h; SD = 226.7) and are probably not reflective of population status. The catch rate in 2009 was 725.5/h (Appendix A). Bluegill catch rates were high in 2007 (510.5/h) and 2008 (507.0/h), but declined in 2009 (261.5/h) (Figure 3). Few anglers sought sunfish (1.6% of total fishing effort) (Table 5), but they were frequently harvested by anglers seeking other species (Table 7).

Catfish: In 2010, blue catfish catch rates increased to 11.9 fish/nn (Figure 5). Increased catch was due to higher numbers of 14- to 20-inch fish. Fish in excess of 30 inches were caught in each of the last three survey years. Fish were in good condition as W_r ranged from 82 to 130.

Catch rates of channel catfish have varied during the last three survey years (2006 = 6.8/nn; 2008 = 2.6/nn; 2010 = 8.7/nn) (Figure 6). Population size structure was dominated by smaller fish (PSD range = 14 to 25).

Directed rod and reel angler effort declined in 2008/2009, but remained stable in 2009/2010 (Table 8). Catfish anglers accounted for 2.1% of the total fishing effort (Table 5). Total estimated harvest was 14,955 fish; 85% of harvested fish were channel catfish (Figure 8). Anecdotal information indicated that blue catfish provided a substantial passive gear fishery.

Temperate basses: Historically, gill net catch rates of white bass have averaged 1.7/nn, reflecting a low-density population in the reservoir. During the last three survey years, catch rates ranged from 0.3 to 3.4/nn (Figure 9). In 2009/2010, no directed fishing effort was observed on the Texas side of the reservoir (Table 5), but 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. During the last three survey years, only two fish were caught with gill nets and few anglers targeted striped bass (Table 5). During 2009/2010, no angler harvest was observed.

Creel surveys indicated yellow bass abundance was relatively high, as yellow bass comprised 66% of

temperate bass harvest (26,030 fish; Figure 10).

Black bass: Spotted bass were present in the reservoir, but few were collected by electrofishing (Figure 11). Approximately 10,000 fish were harvested in 2009/2010 (Figure 14).

Fall electrofishing catch rates during 2007 to 2009 reflected relatively high and stable largemouth bass abundance (range = 116.0 to 159.0/h; Figure 12). Population size structure was similar across years (PSD range = 45 to 58; PSD-14 range = 22 to 27). In 2009, relative weights ranged from 92 to 108, indicating largemouth bass were in good condition.

Spring electrofishing catch rates were similar to fall surveys (range = 124.5 to 207.5/h) (Figure 13). However, spring surveys reflected higher proportions of larger fish (PSD range = 60 to 69; PSD-14 range = 26 to 39).

The majority of total fishing effort on the Texas side of Toledo Bend Reservoir (76.3%) was directed at black basses (32.3% was tournament-related) (Table 5). From 2007 to 2010, angler catch rates were relatively high and consistent, exceeding 0.8/h during all three survey periods (Table 10). During 2009/2010, total directed effort (363,248 h) and harvest (132,346 fish) increased considerably. Since 2007/2008, the annual number of fish tournament-retained doubled, and total annual traditional harvest increased by a factor of 3.7. Due to the increase in traditional harvest, the actual proportion of fish retained during tournaments decreased over the last three years to 29%. Total catch of fish $\geq$ 4 pounds increased significantly in 2009/2010 (6,590 fish; 564 fish $\geq$ 7 pounds) (Table 10).

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 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 to 47.7%, while the proportion of individual anglers ranged from 22.4 to 38.9%. Winning weights ranged from 20.9 to 24.9 pounds for team events and 19.2 to 24.0 pounds for individual events. The proportion of teams with weights > 15 pounds increased over all five survey years to 18.5%, while individual events ranged from 4.9 to 10.5%. 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 (14.4%; Table 5). Although directed effort declined in 2009/2010, catch rates and total harvest increased over the last three survey years to 2.6/h and 137,404 fish (77% black crappie) (Table 12; Figure 16).

Fisheries management plan for Toledo Bend Reservoir, Texas

Prepared – July 2010

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 (32% 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 2008).

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 aerial flights to document plant distribution and effects of control measures (i.e., herbicides, booms, weevils).
3. At access points, maintain all educational signs and continue herbicide treatments to prevent transport to other waters.
4. In cooperation with TPWD Communications Division, continue educational campaign via media releases, signage, and informational booths at public events.
5. 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.
6. Continue to investigate effects of salvinia weevil releases.
7. 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 (14% of the total annual fishing effort; 137,404 fish harvested).

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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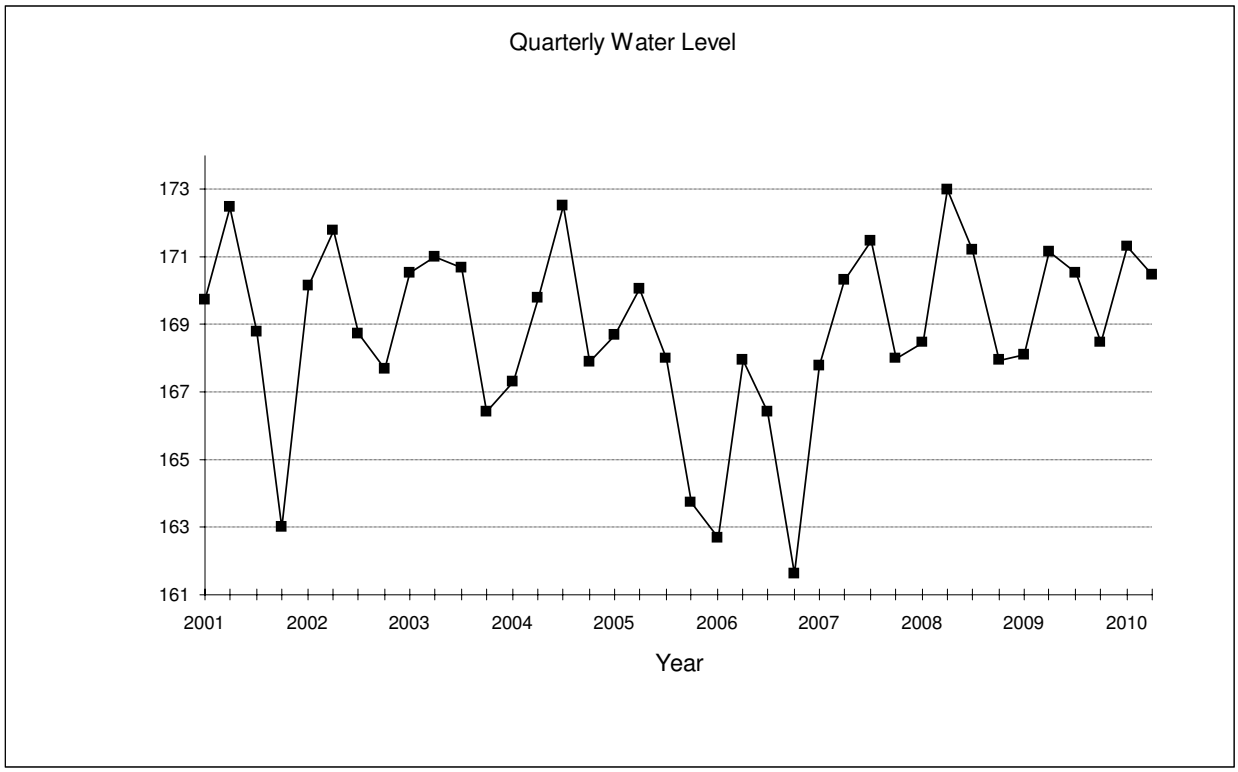


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Toledo Bend Reservoir, Texas.

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	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. 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		FGL	
	Total	13,105,747		
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

Species	Year	Number	Life Stage	Mean TL (in)
	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 2009. 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
American lotus	725 (<1)	834 (<1)	1,729 (1)	838 (<1)
Giant salvinia	2,002 (1)	2,555 (2)	4,091 (3)	2,555 (2)
Hydrilla	4,477 (3)	6,334(4)	4,373 (3)	8,544 (5)
Potamogeton spp.	19 (<1)	379 (<1)	432 (<1)	343 (<1)
Water hyacinth	Trace	1,525 (1)	2,822 (2)	78 (<1)

Table 5. Percent directed angler effort by species for Toledo Bend Reservoir, Texas, 2007 to 2010. For black basses, proportions of tournament-angler effort are in parentheses.

Species	Year		
	2007/2008	2008/2009	2009/2010
Catfishes	8.9	2.6	2.1
Yellow bass	0.6	0.0	0.0
Striped bass	0.9	0.0	0.0
Temperate basses	1.4	0.5	0.8
Sunfishes	3.0	4.0	1.6
Black basses	62.4 (33.3)	70.3 (32.2)	76.3 (32.3)
Crappies	18.6	21.8	14.4
Anything	4.4	0.8	4.8

Table 6. Total fishing effort (h) for all species and total directed expenditures at Toledo Bend Reservoir, Texas, 2007 to 2010.

Creel Statistic	Year		
	2007/2008	2008/2009	2009/2010
Total fishing effort	324,205	391,915	476,589
Total directed expenditures	$2,445,561	$3,201,459	$3,322,820

Gizzard Shad

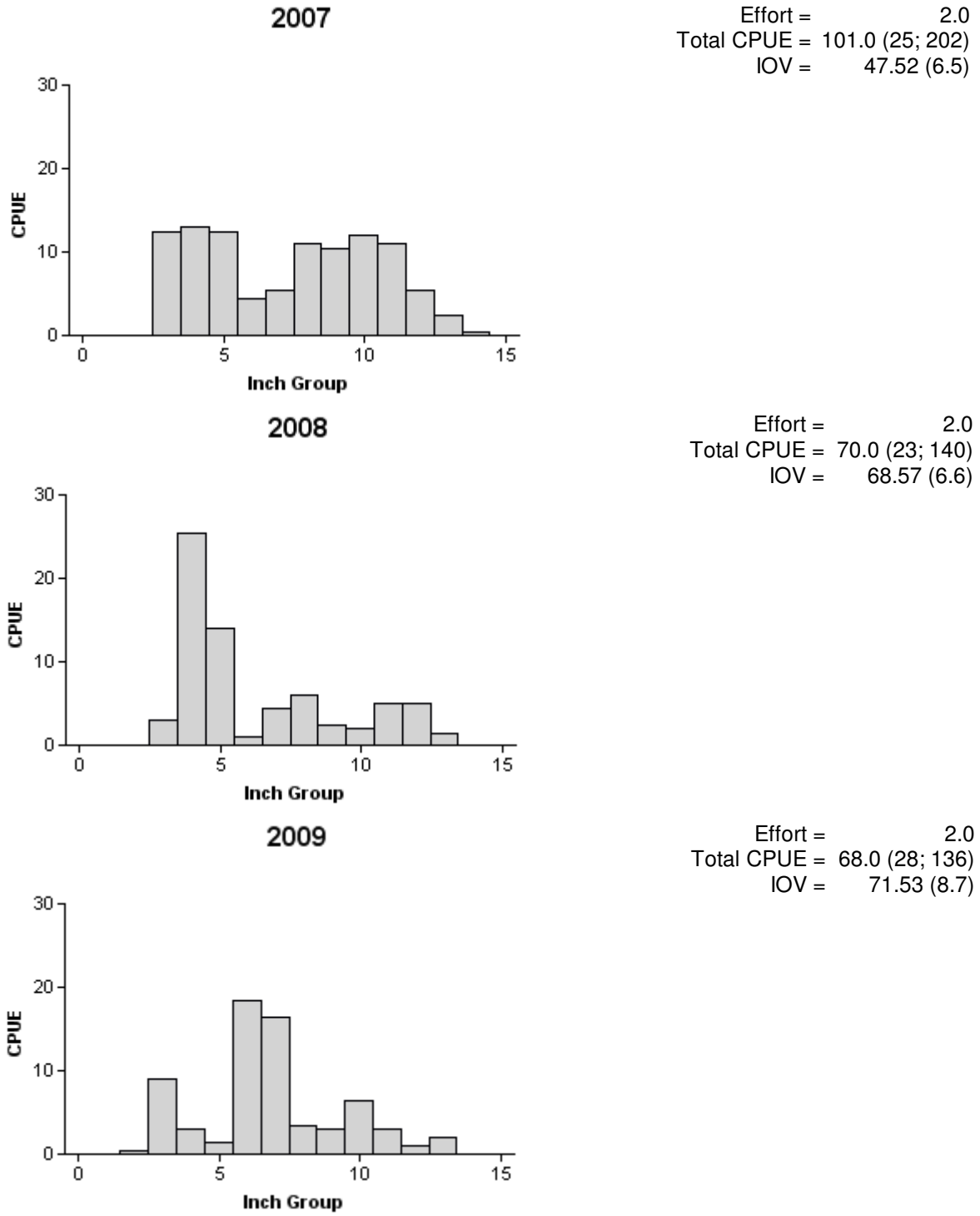
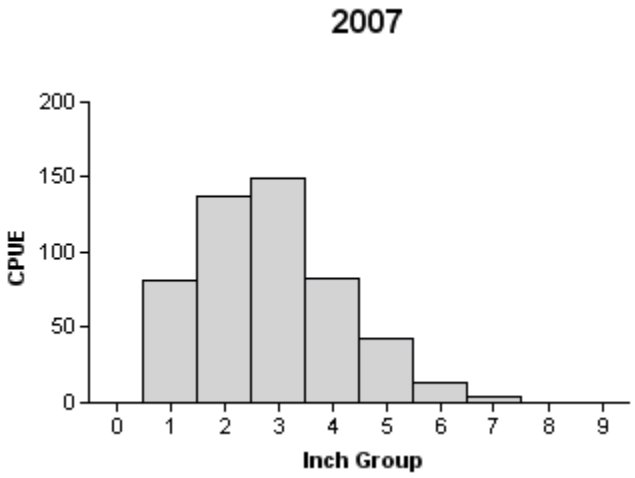
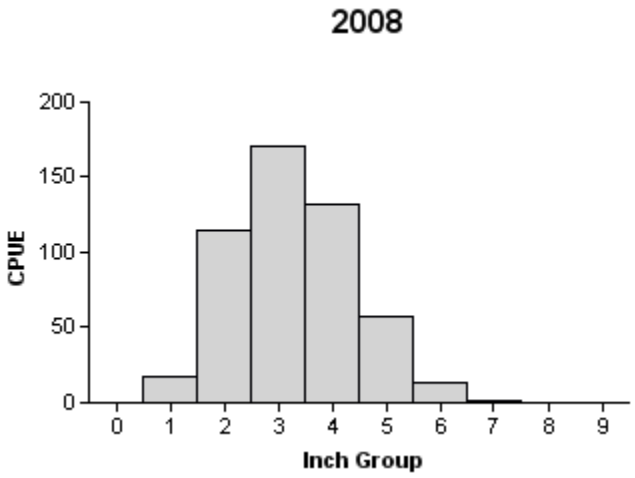


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2007, 2008, and 2009.

Bluegill





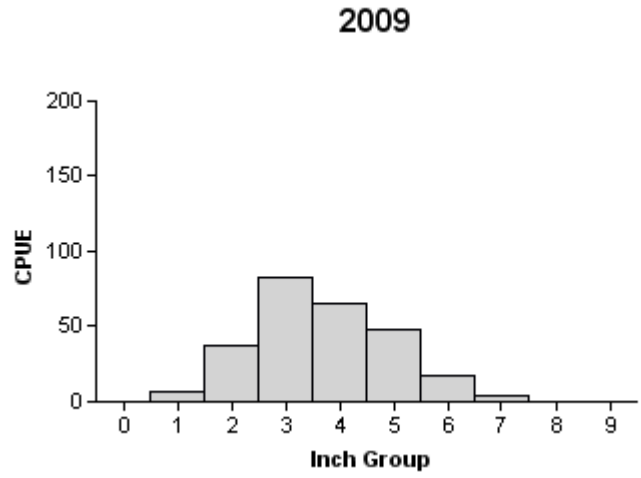


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2007, 2008, and 2009.

Sunfishes

Table 7. Creel survey statistics for sunfishes at Toledo Bend Reservoir, Texas from June 2007 through May 2008, June 2008 through May 2009, and June 2009 through May 2010, 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		
	2007-2008	2008-2009	2009-2010
Directed effort (h)	9,553 (41)	15,575 (32)	7,799 (45)
Directed effort/acre	0.13 (41)	0.22 (32)	0.11 (45)
Total catch per hour	2.35 (43)	2.90 (51)	4.22 (55)
Total harvest	65,871 (64)	59,688 (21)	28,498 (83)
Harvest/acre	0.93 (64)	0.84 (21)	0.40 (83)
Percent legal released	38	17	66

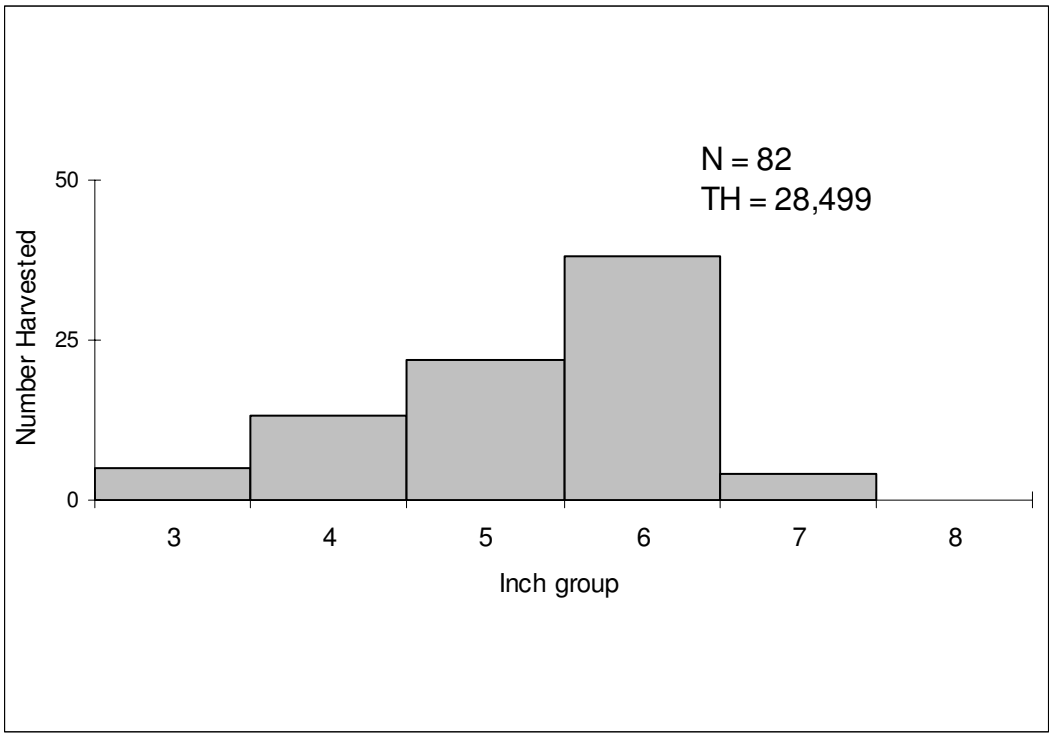


Figure 4. Length frequency of harvested bluegill observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested bluegill observed during creel surveys, and TH is the total estimated harvest for the creel period.

Blue Catfish

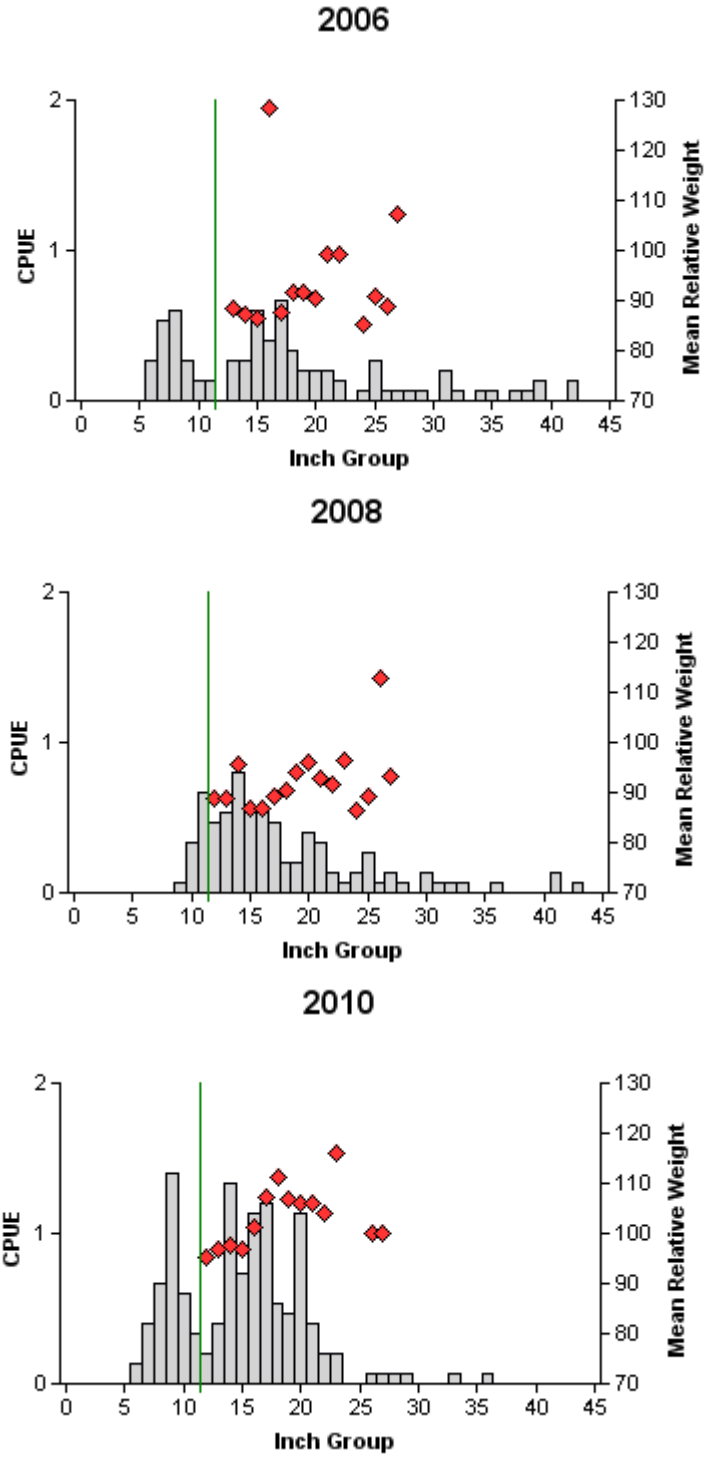


Figure 5. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2006, 2008, and 2010. Vertical lines indicate minimum length limit.

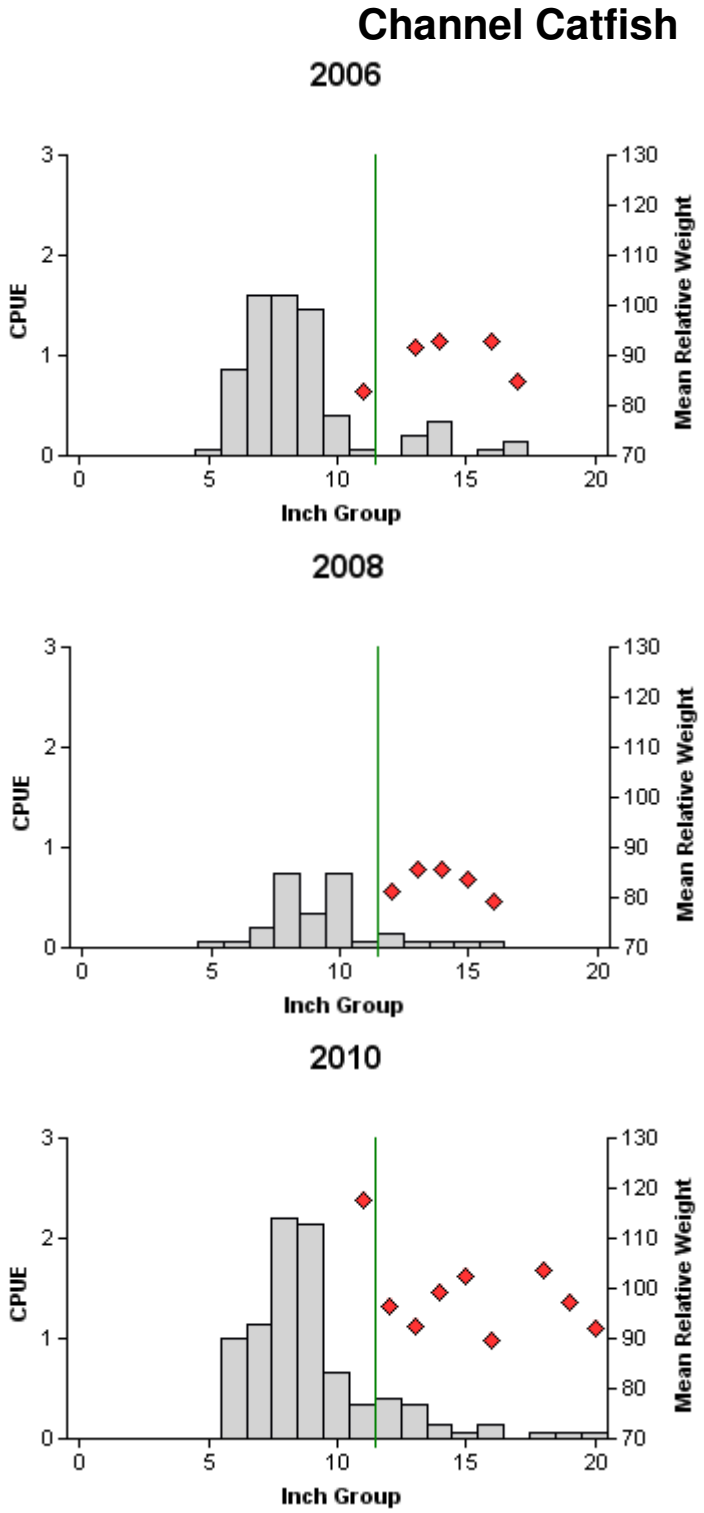


Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2006, 2008, and 2010. Vertical lines indicate minimum length limit.

Catfishes

Table 8. Creel survey statistics for catfishes at Toledo Bend Reservoir, Texas from June 2007 through May 2008, June 2008 through May 2009, and June 2009 through May 2010, 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		
	2007-2008	2008-2009	2009-2010
Directed effort (h)	28,469 (34)	9,985 (34)	9,907 (37)
Directed effort/acre	0.41 (34)	0.14 (34)	0.14 (37)
Total catch per hour	2.23 (31)	0.97 (55)	2.18 (82)
Total harvest	39,147 (42)	8,286 (260)	14,954 (125)
Harvest/acre	0.55 (42)	0.12 (260)	0.21 (125)
Percent legal released	4	4	1

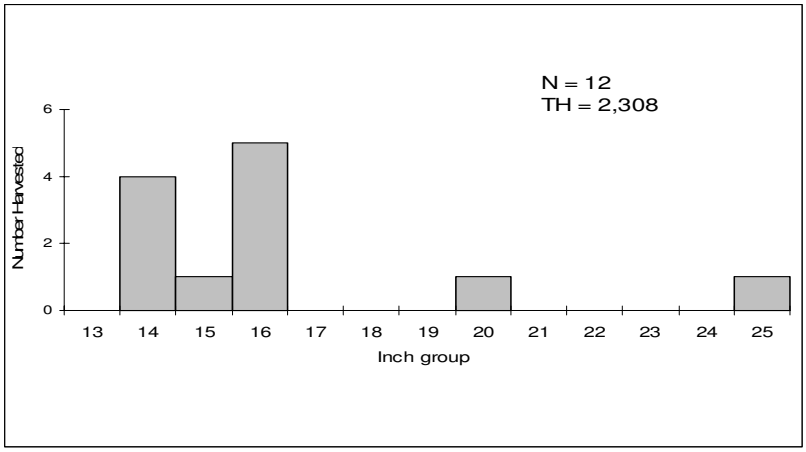


Figure 7. Length frequency of harvested blue catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

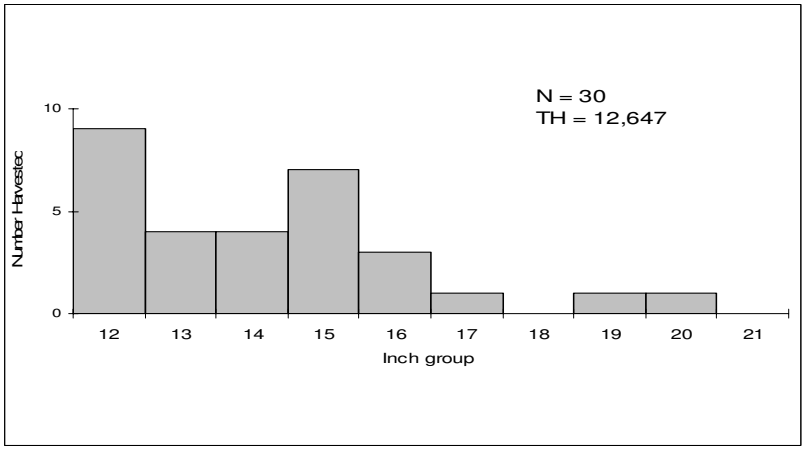


Figure 8. Length frequency of harvested channel catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

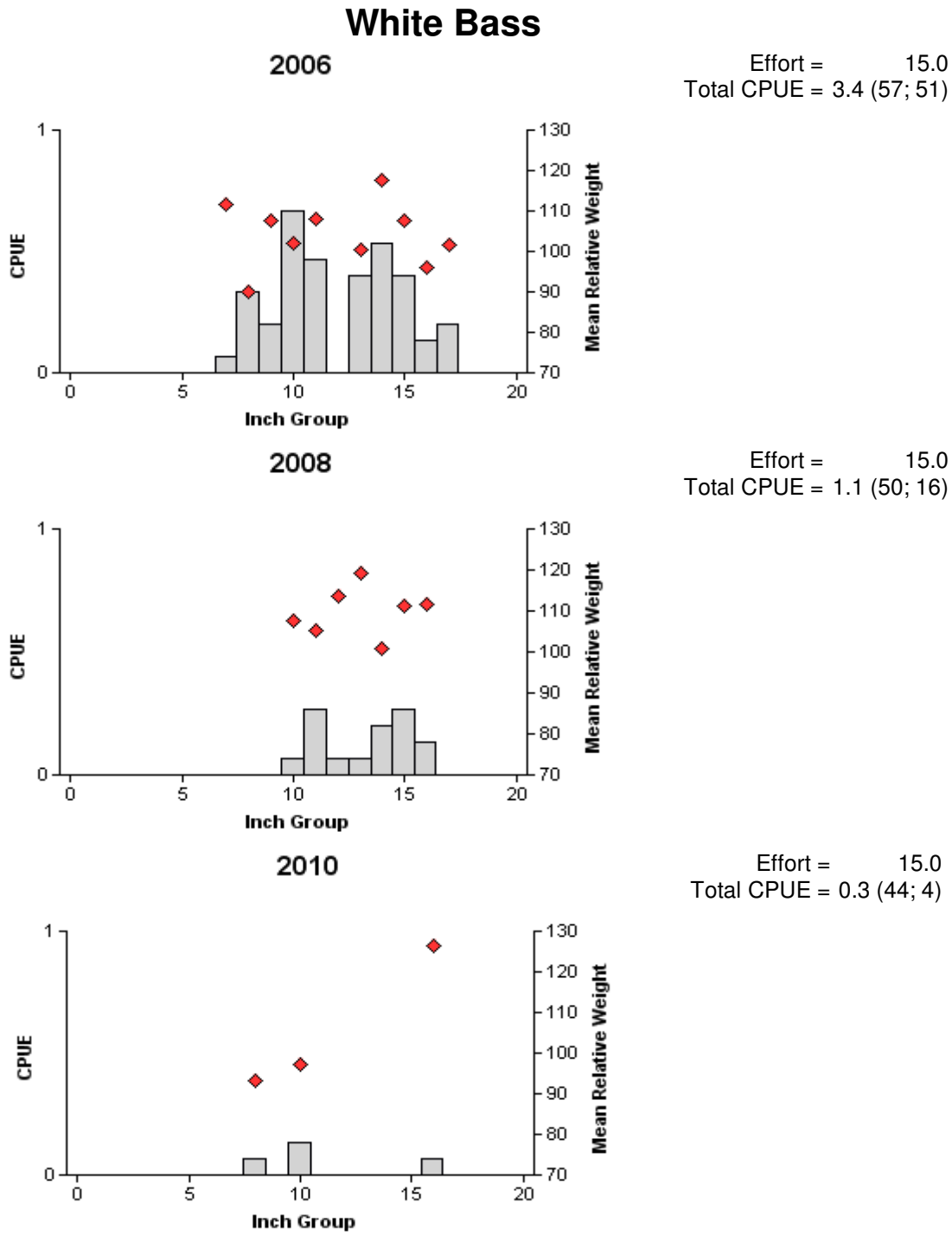


Figure 9. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2006, 2008, and 2010.

Temperate basses

Table 9. Creel survey statistics for temperate basses at Toledo Bend Reservoir, Texas from June 2007 through May 2008, June 2008 through May 2009, and June 2009 through May 2010, where total catch per hour is for anglers targeting temperate basses and total harvest is the estimated number of temperate basses 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		
	2007-2008	2008-2009	2009-2010
Directed effort (h)	9,478 (35)	2,127 (62)	3,644 (56)
Directed effort/acre	0.13 (35)	0.03 (62)	0.05 (56)
Total catch per hour	11.72 (99)	2.04 (120)	6.57 (47)
Total harvest	37,184 (71)	9,868 (187)	39,544 (101)
Harvest/acre	0.52 (71)	0.14 (187)	0.56 (101)
Percent legal released	44	16	23

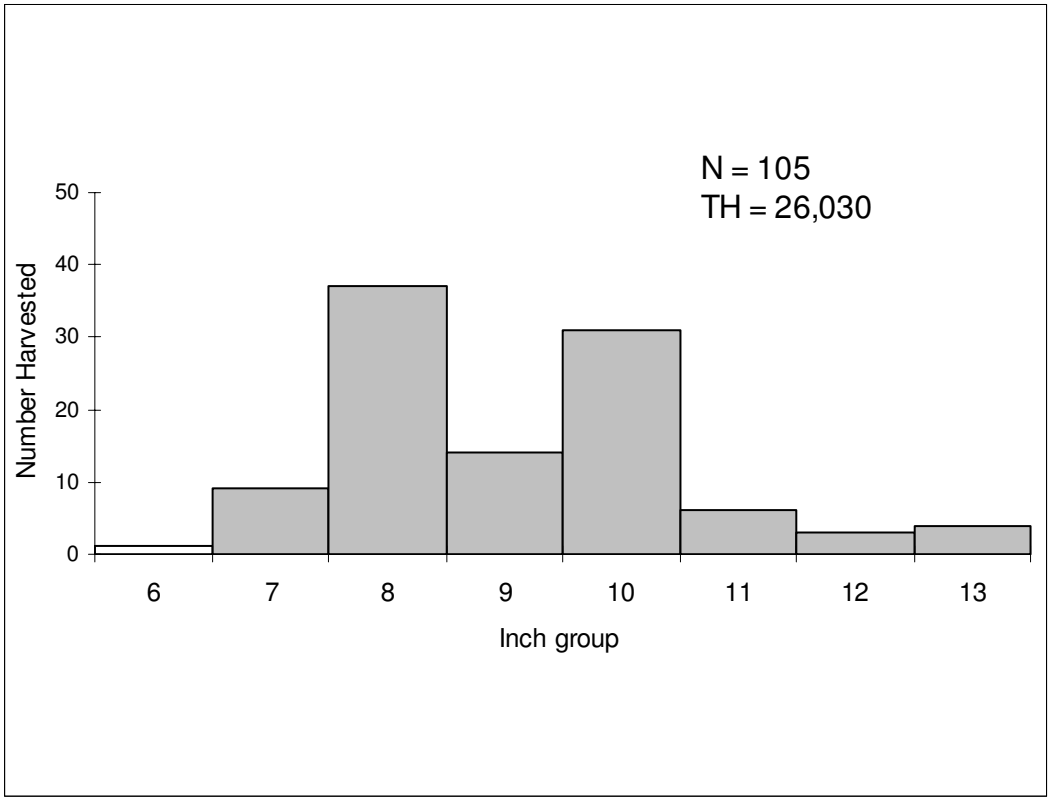


Figure 10. Length frequency of harvested yellow bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested yellow bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

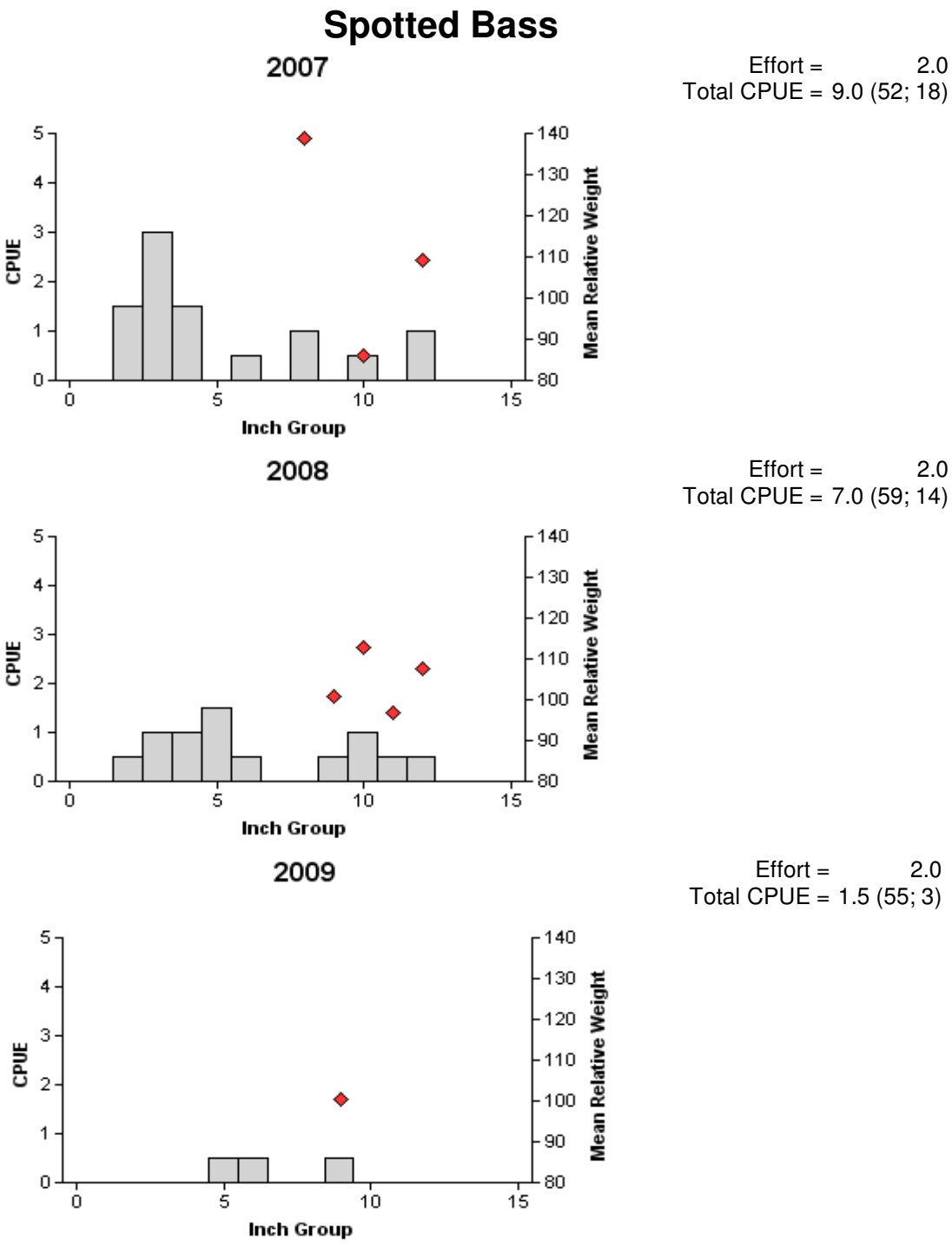
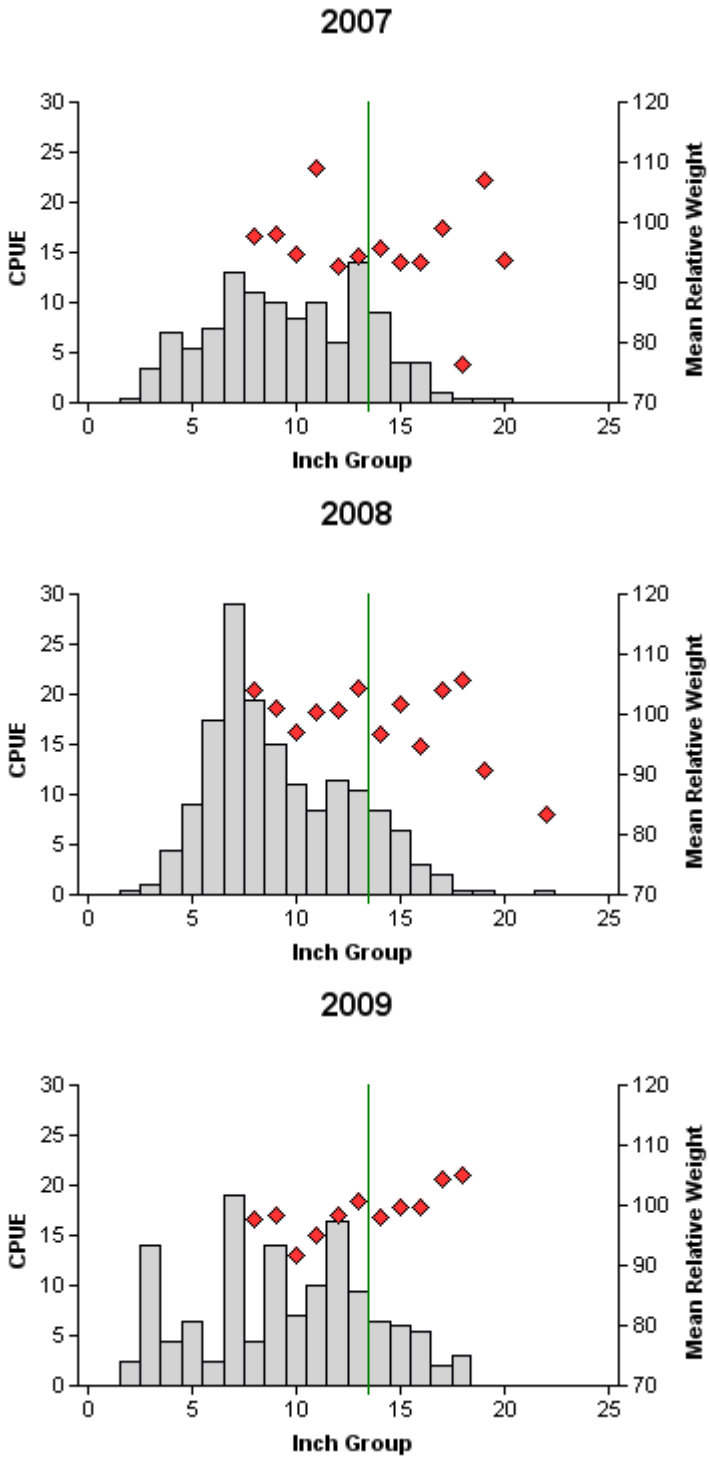


Figure 11. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2007, 2008, and 2009.

Largemouth Bass



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

Effort =	2.0
Total CPUE =	159.0 (15; 318)
Stock CPUE =	97.5 (16; 195)
PSD =	45 (2.9)
PSD-14 =	22 (2.6)

Effort =	2.0
Total CPUE =	133.5 (14; 267)
Stock CPUE =	84.5 (16; 169)
PSD =	58 (4.3)
PSD-14 =	27 (4.5)

Figure 12. 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, 2007, 2008, and 2009. Vertical lines indicate minimum length limit.

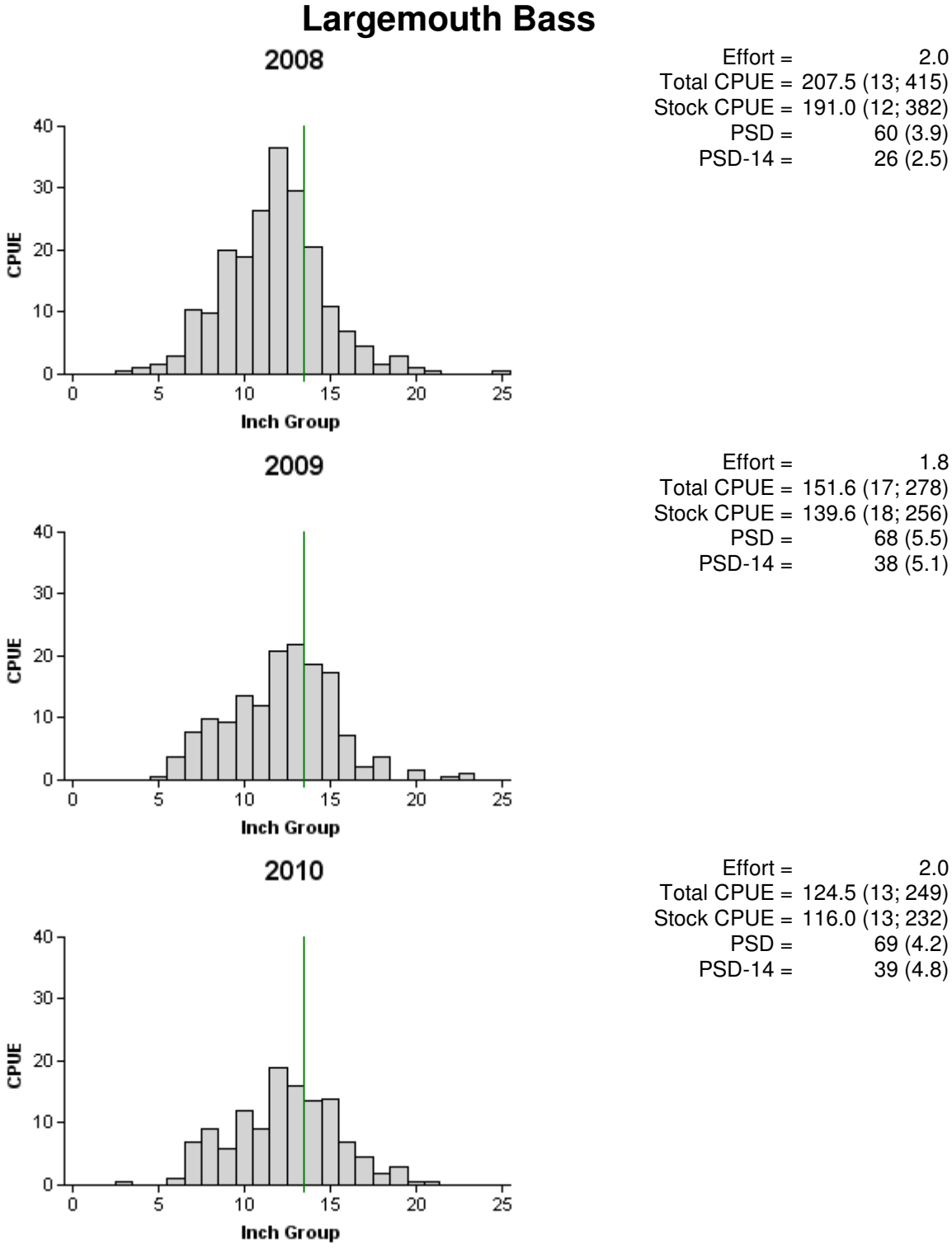


Figure 13. Number of largemouth bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Toledo Bend Reservoir, Texas, 2008, 2009, and 2010. Vertical lines indicate minimum length limit.

Black basses

Table 10. Creel survey statistics for black basses at Toledo Bend Reservoir, Texas from June 2007 through May 2008, June 2008 through May 2009, and June 2009 through May 2010, 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		
	2007-2008	2008-2009	2009-2010
Directed effort (h)	199,546 (18)	274,935 (24)	363,248 (20)
Directed effort/acre	2.81 (18)	3.87 (24)	5.12 (20)
Total catch per hour	1.06 (20)	0.81 (14)	1.09 (12)
Total catch			
4 – 6.9 pound fish	1,790 – 0.5%	1,293 – 0.5%	6,026 – 1.2%
7 – 9.9 pound fish	381 - <0.1%	0	480 – 0.1%
≥ 10 pound fish	0	0	84 - <0.1%
Total harvest	43,195 (16)	92,996 (45)	132,346 (34)
Traditional harvest	25,485	58,587	93,966
Tournament-retained	17,710	34,409	38,380
Percent harvest tournament-retained	41	37	29
Harvest/acre	0.61 (16)	1.31 (45)	1.86 (34)
Percent legal released	62	18	24

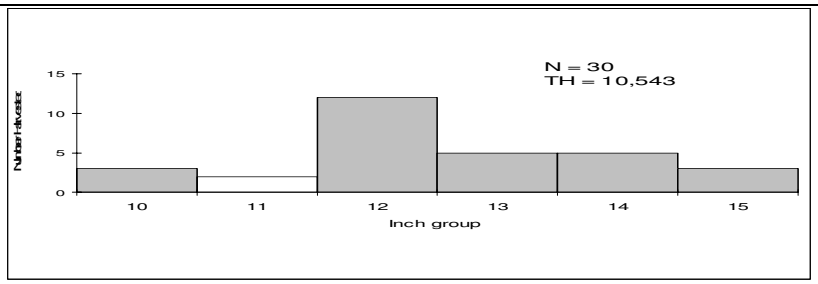


Figure 14. Length frequency of harvested spotted bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

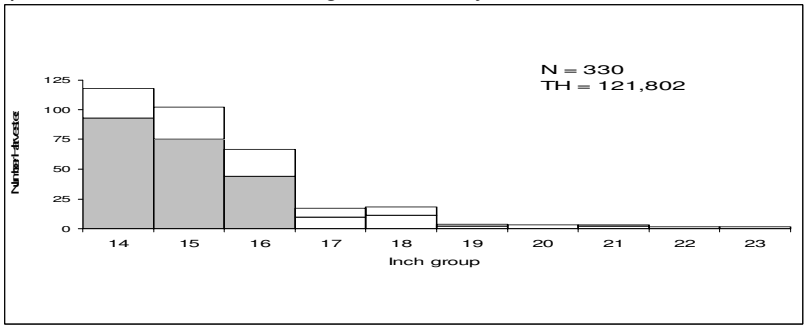


Figure 15. Length frequency of harvested largemouth bass (white = tournament-retained; grey = harvested) observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Crappies

Table 12. Creel survey statistics for crappies at Toledo Bend Reservoir, Texas from June 2007 through May 2008, June 2008 through May 2009, and June 2009 through May 2010, 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		
	2007/2008	2008/2009	2009/2010
Directed effort (h)	59,418 (23)	85,170 (28)	68,750 (23)
Directed effort/acre	0.84 (23)	1.20 (28)	0.97 (23)
Total catch per hour	1.55 (35)	1.82 (31)	2.61 (23)
Total harvest	67,189 (56)	110,712 (49)	137,403 (27)
Harvest/acre	0.95 (56)	1.56 (49)	1.93 (27)
Percent legal released	4	<1	1

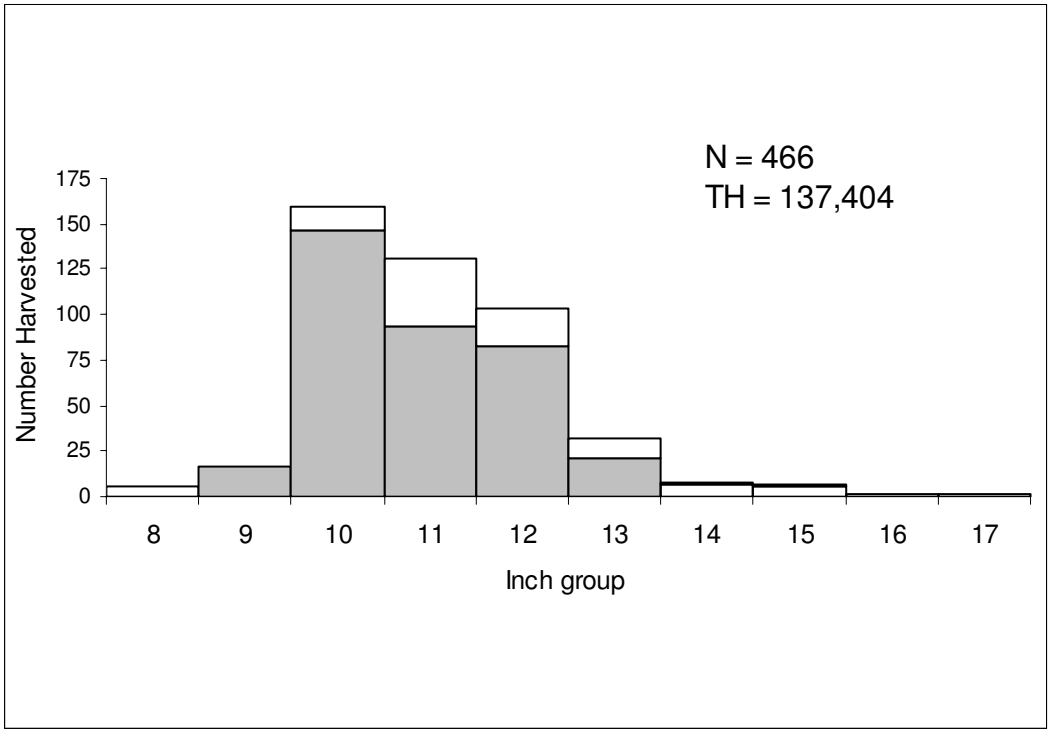


Figure 16. Length frequency of harvested crappies (white = white crappie; grey = black crappie) observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 13. 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.

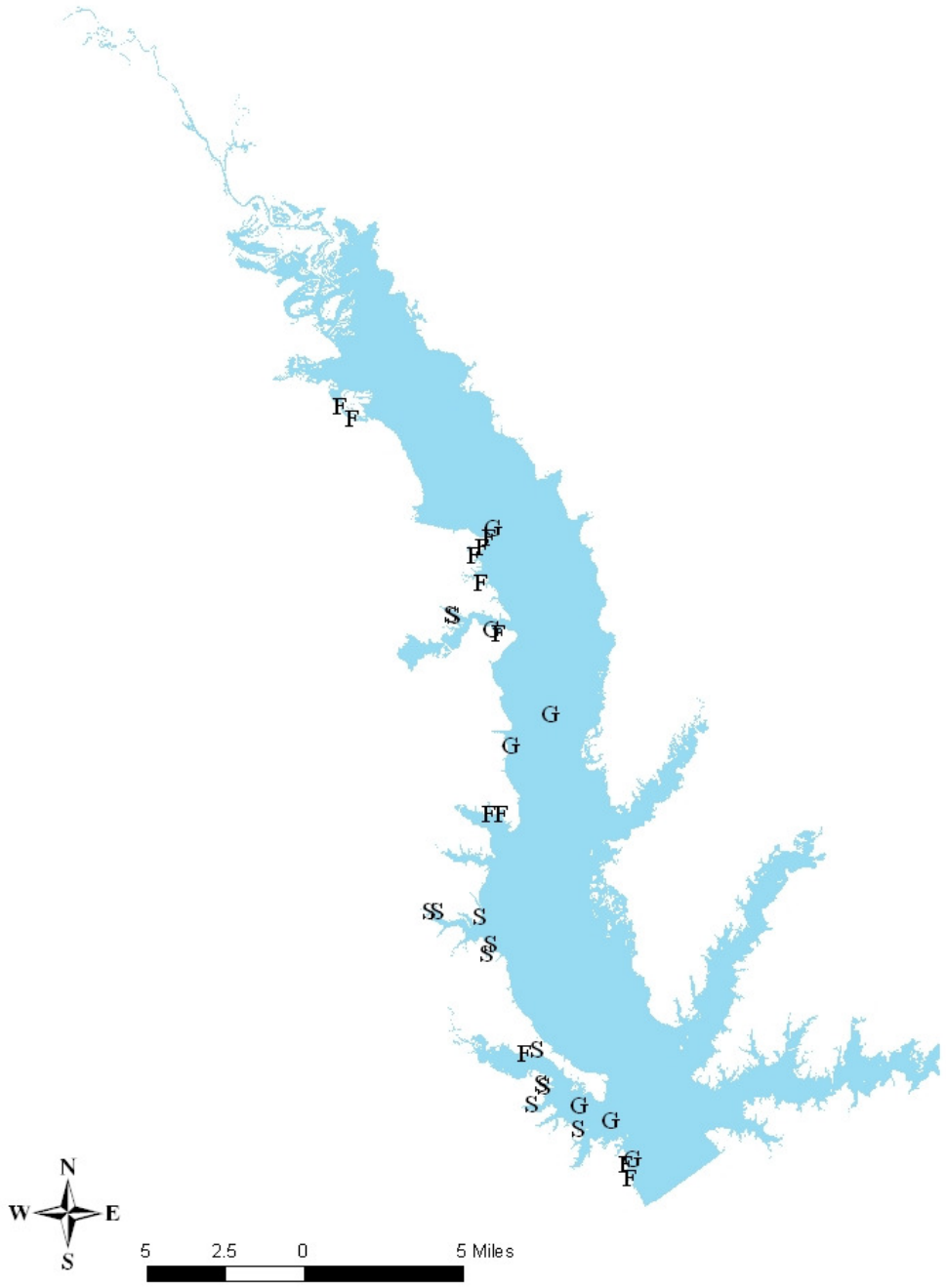
Survey Year	Fall Electrofisher	Spring Electrofisher	Gill Net	Creel Survey	Vegetation	Report
2010-2011	A	A			A	
2011-2012	S	A	S	A	S	S
2012-2013	A	A			A	
2013-2014	A	A	A	A	A	A

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Toledo Bend Reservoir, Texas, 2009 to 2010.

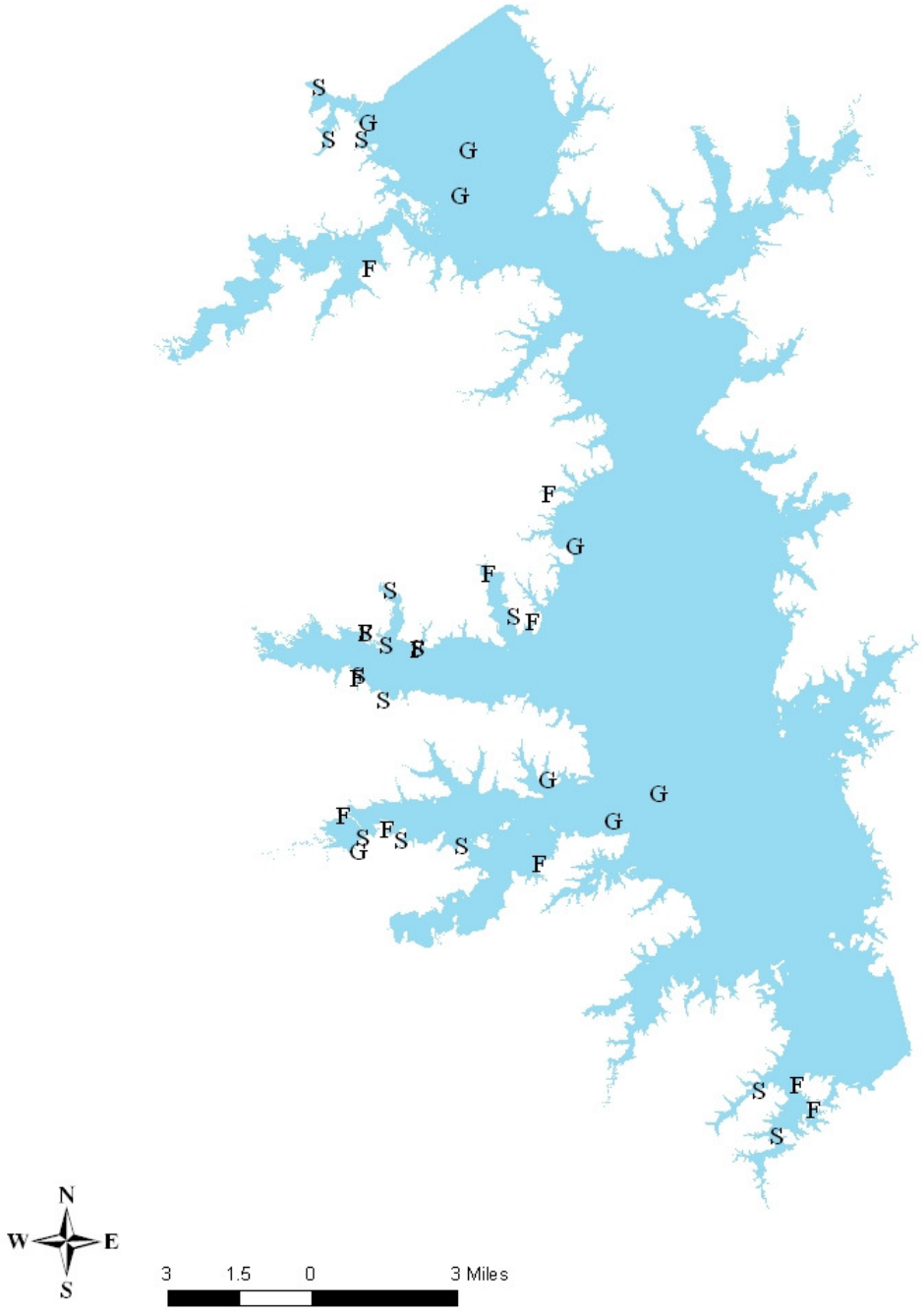
Species	Gill Netting		Fall Electrofishing	
	N	CPUE	N	CPUE
Spotted gar	11	0.7		
Gizzard shad			137	68.5
Threadfin shad			1,451	725.5
Blue catfish	178	11.9		
Channel catfish	130	8.7		
White bass	4	0.3		
Yellow bass	85	5.7		
Redbreast sunfish			68	34.0
Warmouth			4	2.0
Bluegill			523	261.5
Longear sunfish			20	10.0
Redear sunfish			82	41.0
Spotted sunfish			14	7.0
Spotted bass			3	1.5
Largemouth bass			249	124.5
White crappie	9	0.6		
Black crappie	39	2.6		
Freshwater drum	3	0.2		

APPENDIX B



Location of sampling sites, north Toledo Bend Reservoir, Texas, 2009 to 2010. 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, 2009 to 2010. Gill net and spring and fall electrofishing are indicated by G, S, and F, respectively. Water level was near full pool at time of sampling.

APPENDIX C

Results from individual and team format bass tournaments at Toledo Bend Reservoir, 2005 to 2009. Only tournaments with 5-fish bag limits and > 50 individuals or 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
				Individual			
2007	3	24.0	21.0	19.7	4.9	22.4	8.8
2008	7	21.0	19.2	18.4	10.5	38.9	8.7
2009	10	19.2	17.2	15.9	5.2	26.1	7.7
				Team			
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
2008	8	23.1	21.9	20.0	13.1	43.7	8.7
2009	5	24.9	23.8	21.5	18.5	47.7	9.3