

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-31

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2005 Survey Report

Toledo Bend Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Toledo Bend Reservoir were surveyed in 2005-2006 using electrofishing and gill nets. Anglers were surveyed from June 2005 - May 2006 with a creel. This report summarizes results of the surveys and contains a management plan for the reservoir based on those findings.

- **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 water levels reached historic lows in 2001 and 2005. Aquatic habitat consisted of submerged vegetation and standing timber.
- **Management history:** Creel surveys indicated that largemouth bass and crappie fisheries were most popular at Toledo Bend Reservoir. Florida largemouth bass have been stocked annually since 1988 in an effort to obtain $\geq 20\%$ pure Florida largemouth bass in the population. Since 1987, joint efforts with Louisiana Department of Wildlife and Fisheries (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. Eradication efforts on both Texas and Louisiana sides of the reservoir were unsuccessful. In 2004, plant coverage exceeded 3,000 acres and impeded angler access. Low water levels in 2005 reduced coverage to 281 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 in the reservoir. Electrofishing surveys indicated these species provided ample forage.
 - **Catfishes:** Abundance of blue and channel catfish were stable compared to previous years, providing anglers with good fishing success. Average angler catch rates were 1.8 fish/h. Flathead catfish were present in the reservoir.
 - **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 angler catch rate averaged 7.85 fish/h and annual harvest exceeded 67,000 fish.
 - **Black basses:** Spotted bass were present in low numbers. Largemouth bass were relatively abundant, and size structure and fish condition was good. The largemouth bass fishery was most popular (67.4% of anglers targeted bass). Angler catch rates were high, averaging 0.78/hour.
 - **Crappie:** White and black crappie were present in the reservoir. Angler catch (1.9/hour) and harvest rates (1.1/hour) reflect an abundant crappie population. Annual harvest exceeded 185,000 fish (76% black crappie).
- **Management strategies:** Stock Florida largemouth bass annually to maintain and improve trophy fish numbers. Monitor largemouth bass population annually with electrofishing (both spring and fall) and creel surveys. Continue tournament-monitoring program to more effectively monitor catches of larger fish. Continue discussions with LDWF to standardize harvest regulations for catfish and crappies. Monitor giant salvinia coverage annually to document plant distribution and effects of control measures. Monitor the crappie fishery with annual creel surveys. Monitor the catfish population with gill nets every other year. Continue to publish monthly articles in the Lakecaster highlighting departmental activities.

INTRODUCTION

This document is a summary of fisheries data collected from Toledo Bend Reservoir in 2005-2006. 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 is presented with the 2005-2006 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 reservoir was constructed by the Sabine River Authority (SRA) in 1966 for flood control, generation of hydroelectric power, and water supply for municipal, industrial, agricultural, and recreational uses. 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. However, water levels reached historic lows in 2001 (162.9 feet) and 2006 (162.5 feet) (Figure 1). The reservoir was mesotrophic with a mean Trophic State Index chl-*a* of 57.7. Angler access was good, with 33 public access areas present on the Texas side of the reservoir. The majority of aquatic habitat consisted of submerged vegetation (primarily hydrilla) 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 2004) included:

1. Stock Florida largemouth bass (FLMB) annually (100 fingerlings/acre) in 5,000-acre embayment until FLMB genotypes constitute $\geq 20\%$ of the population within embayment.
Action: Since 2000, FLMB have been stocked annually in Housen Bayou embayment. Embayment FLMB genotypes ranged from 0.0% (2002) – 14.6% (2004) (Table 12).
2. Distribute fish handling procedures that minimize tournament-related mortality of black bass to tournament anglers and organizers.
Action: Fish handling information was distributed via press releases, brochures, email, telephone conversations, and public presentations.
3. Conduct annual electrofishing (fall and spring) and creel surveys to monitor status of largemouth bass population.
Action: Surveys were conducted from 2004 – 2006 and indicated relatively stable largemouth bass population abundance and angling success.
4. In conjunction with Louisiana Department of Wildlife and Fisheries (LDWF), standardize recreational harvest regulations for crappies (10-inch minimum length limit, 50-fish bag limit), catfish (LDWF statewide regulations), spotted bass (no minimum length limit), and yellow bass (no harvest restrictions).
Action: In 2004, LDWF and TPWD staff agreed on proposed, standardized regulations. Regulations were changed and standardized for spotted bass and yellow bass. However, the LDWF Commission did not approve the proposed regulation for crappies. Crappie and catfish regulations remain different (Table 2).
5. Conduct annual vegetation surveys to monitor giant salvinia and hydrilla abundance and recommend management strategies.
Action: Giant salvinia was first documented at Toledo Bend Reservoir in 1998. Since that time, annual vegetation surveys have indicated reservoir-wide distribution and coverage reached 3,000 acres in 2004 (Table 4). Herbicide treatments targeted plant coverages at access points to reduce transfer potential to other waters. High emphasis has been placed on public education via press releases and signage at all major Toledo Bend-Texas boat ramps to prevent transfer. Reservoir-wide control options discussed

and implemented with SRA included salvinia weevil releases (2004 and 2005) and a fall/winter water level drawdown (2005). In 2005, coverage decreased to 281 acres. Water levels reached historic lows in Fall 2005 due to drought conditions, making a controlled drawdown unnecessary. Water level drawdowns combined with release of salvinia weevils may be viable long-term control options

6. Publish monthly popular articles in the Lakecaster, a newsletter distributed to 30 counties and parishes in Texas and Louisiana.

Action: Articles highlighting TPWD activities at Toledo Bend and Sam Rayburn reservoirs have been published monthly since 2000.

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

Stocking history: Toledo Bend Reservoir has received annual stockings of striped bass (since 1976) and FLMB (since 1988) (Table 3). Since 1992, the striped bass stockings have all been conducted by LDWF with the exception of one TPWD stocking in 2002. Since 2000, FLMB have been stocked in a 5,000-acre embayment (Housen Bayou) at a rate of 100 fingerlings/acre to maximize stocking influence.

Vegetation/habitat history: Historically, aquatic vegetation coverage at Toledo Bend Reservoir (primarily hydrilla) has exceeded 20,000 surface acres (Table 4). Although a diverse plant community was still present (12 species documented in 2005), vegetation coverage declined considerably since 2002 and was likely due to low water levels in 2001 and 2005. In 1998, giant salvinia was discovered in Toledo Bend Reservoir. In 2004, plant coverage exceeded 3,000 acres. Low water levels in 2005 reduced salvinia abundance to 281 acres. An aerial survey in May 2006 indicated coverage was > 2,000 acres, with most in isolated backwaters in the northern half of the reservoir.

METHODS

Fishes were collected by electrofishing (2.0 hours at 24 5-min stations during both 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 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 relative weight (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 ($RSE = 100 \times SE \text{ of the estimate/estimate}$) was calculated for all CPUE and creel statistics and SE was calculated for structural indices and IOV. Source for water level data was the United States Geological Survey website.

A roving creel survey (36 days; 9 days per quarter) was conducted from June 2005 - May 2006 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

An aquatic vegetation survey was conducted in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

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). In 2005, total coverage of aquatic vegetation was 3,639 surface acres (primarily hydrilla and American lotus), considerably lower than in 2004 (11,763 acres) (Table 4).

Creel: Similar to previous survey years, fishing effort at Toledo Bend Reservoir was primarily directed at black basses (67.4%) and crappies (21.7%) (Table 5). Total fishing effort for all species was 363,835 h and declined from previous years (Table 6). Reduced fishing effort likely resulted from low lake levels and lack of angler access during September – January (Figure 1). Annual angler expenditures (\$2,592,065) also declined from previous years.

Prey species: Primary prey species included gizzard shad, threadfin shad, and bluegill. All three species provided abundant prey. Gizzard shad catch rates in 2003 (166.5/h), 2004 (163.0/h), and 2005 (135.5/h) were similar (Figure 2) and exceeded the historical reservoir average (1986 – 2004) (93.3/h). Index of vulnerability (IOV) values were also similar, ranging from 33.7 - 49.3. Total CPUE of threadfin shad was 115.5/h (Appendix A) and similar to the historical average (179.0/h). Bluegill catch rate was 253.5/h and similar to 2003 (291.0/h) and 2004 (236.5/h) (Figure 3), but was lower than the historical average (369.7/h). Few anglers target sunfishes (2.2% of total fishing effort), but they are frequently harvested by anglers seeking other species.

Catfishes: Since 2004, blue catfish recruitment has been relatively steady. Catch rates ranged from 6.4 to 6.6/nn (Figure 4) and exceeded the historical average of 4.7/nn. The number of memorable size (≥ 28 inches) fish increased in 2006. Fish were in good condition as W_r ranged from 80 - 130.

Historically, channel catfish catch rates have been relatively low (3.2/nn). Since 2004, surveys indicated an increase in recruitment rates, as catch rates were higher than the historical average and steadily increased (2004 – 4.7/nn; 2005 – 5.3/nn; 2006 – 6.8/nn) (Figure 5).

Creel data consistently indicate relatively low rod and reel effort directed at catfish (< 3% of total fishing effort) (Table 5). However, observations during creel surveys indicate passive gear effort is considerably higher. The majority of catfish harvested ranged from 12 – 18 inches in length (Figures 6 and 7).

Temperate basses: Historically, gill net catch rates of white bass have averaged 1.8/nn, indicating a low-density population in the reservoir. Since 2004, catch rates ranged from 0.5 – 3.4/nn (Figure 8). Directed fishing effort for white bass was also very low (< 2% of total fishing effort) (Table 5), but anecdotal information suggests a popular fishery exists in the Sabine River upstream of the reservoir.

Striped bass were stocked annually by the LDWF to support a broodfish population for palmetto bass production. Few striped bass were observed in creel surveys and directed effort is minimal (< 1% of total fishing effort) (Table 5). No striped bass were caught in 2006 gill net samples (Figure 11).

Creel surveys indicated yellow bass abundance was relatively high. Angler catch rates were high, averaging 7.85/h (Table 9) and 67,136 fish were harvested (Figure 10).

Black basses: Spotted bass were present in the reservoir, but few were collected by electrofishing (historical average = 2.1/h) and they contribute little to annual harvest. Less than 6,000 fish were harvested during the last annual creel period (Figure 15).

Electrofishing catch rates of largemouth bass from the most recent fall (109.0/h) and spring surveys (137.2/h) were lower than the previous two years (Figures 13 and 14). Low water levels and limited littoral habitat may have reduced catch from both surveys. The fall catch rate was also lower than the historical average (140.7/h) but the spring rate was similar to the average (146.7/h). Fall surveys reflected a

relatively stable population size structure primarily comprised of sub-legal fish ($PSD \leq 44$; $RSD-14 \leq 25$) (Figure 13). Size structure from spring surveys was also relatively stable but more desirable (PSD range 58 – 65; $RSD-14$ range = 28 – 31) (Figure 14). Fish condition was good and similar among years as Wr was > 87 for all inch groups.

The majority of total fishing effort at Toledo Bend Reservoir (67.4%) was directed at black basses (Table 5). From 2003 – 2006, angler catch rates and harvest were relatively consistent (Table 11). Catch rates were high and exceeded 0.7 fish/hour during all three creel periods. Harvest ranged from 121,181 – 135,371 fish. Directed fishing hours declined and was likely due to reduced angler access due to low water levels during September 2005 – January 2006.

Since 2002, FLMB alleles (range = 25.3 - 33.8%) and genotype (range = 1.3 - 2.6%) have remained relatively constant (Table 12). Since 2000, FLMB have been stocked in a 5,000-acre embayment at a rate of 100/acre to increase stocking influence. Although FLMB genotype (5.0%) was higher in the stocking embayment, the frequency was below the goal of $\geq 20\%$.

A tournament-monitoring program was implemented in June 2004 to increase information on fish ≥ 14 inches and provide greater insight regarding large (> 20 inches) fish abundance. Although the number of tournaments in 2005 decreased due to low water levels, all tournament variables were relatively similar across survey years and reflect stable population numbers of large fish (Appendix C).

Crappie: 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 (21.7%) (Table 5). During 2003 – 2006, angler catch rates were high and stable, ranging from 1.7 – 2.0/h (Table 13). Similarly, harvest rates were also high and stable (range = 2.2 – 2.6/acre). A total of 185,191 crappies were harvested during the last creel period (76% black crappie) (Figures 17 and 18).

Fisheries management plan for Toledo Bend Reservoir, Texas

Prepared – July 2006

ISSUE 1: Creel surveys indicate most sportfishing effort at Toledo Bend Reservoir is for largemouth bass. The reservoir has also demonstrated the potential for producing trophy fish.

MANAGEMENT STRATEGY

1. Continue embayment stocking of FLMB (100/acre stocked in a 5,000-acre area) to maintain and improve the trophy largemouth bass population. Select different 5,000-acre embayment if FLMB genotypes are > 20% of the population within the current embayment.
2. Continue tournament-monitoring program to increase information on fish \geq 14 inches.
3. Conduct annual electrofishing (both fall and spring) and creel surveys to monitor status of largemouth bass population. Use resampling program developed by Dumont and Schlechte (2004) to determine effort for electrofishing surveys.
4. Examine largemouth bass growth every four years.

ISSUE 2: 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 on crappies and adopting LDWF statewide regulations for catfishes.

ISSUE 3: Since its discovery in 1998, giant salvinia coverage has increased and exceeded 3,000 surface acres in 2004. Historical low water levels in 2005 appeared to reduce coverage in all areas except backwaters in the northern end of the reservoir.

MANAGEMENT STRATEGIES

1. Monitor giant salvinia coverage annually to document plant distribution and effects of control measures (i.e., drawdowns, herbicides, weevils). Explore potential of aerial flight surveys to maximize efficiency.
2. At access points, maintain signs and continue herbicide treatments to prevent transport of giant salvinia to other waters.
3. Continue to investigate effects of salvinia weevil releases.
4. Explore use of containment booms to prevent coverage at boat ramps and enclose plants if distribution allows.
5. Continue to communicate with LDWF regarding plant distribution and control measures.

ISSUE 4: The crappie fishery at Toledo Bend Reservoir is significant, accounting for 22% of the total annual fishing effort. During June 2005 – May 2006, estimated harvest was 185,191 fish.

MANAGEMENT STRATEGIES

1. Due to the ineffectiveness of trap netting, annual creel surveys will be conducted to monitor the crappie fishery.

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

MANAGEMENT STRATEGIES

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 STRATEGIES

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

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual electrofishing (both fall and spring) and creel surveys to closely monitor the popular largemouth bass fishery (Table 14). 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.

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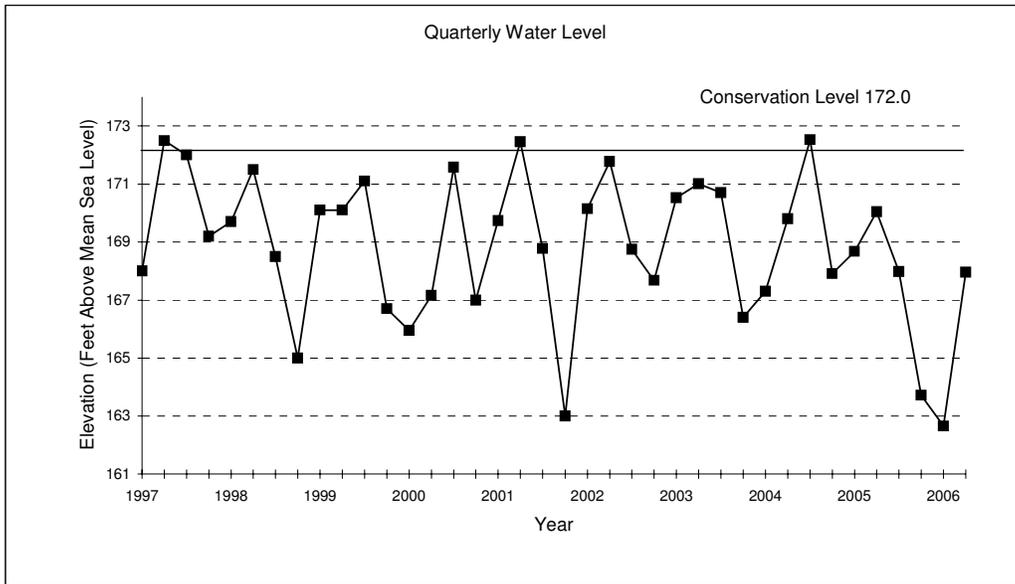


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Toledo Bend Reservoir.

Table 1. Characteristics of Toledo Bend Reservoir.

Characteristic	Description
Year constructed	1966
Controlling authority	Sabine River Authority
Counties	Newton, Sabine, and Shelby
Reservoir type	Mainstream
Shoreline Development Index (SDI)	20.0
Conductivity	120 umhos/cm

Table 2. Harvest regulations for Toledo Bend Reservoir, Texas. Bold characters indicate standardized, reservoir-wide regulations between Texas and Louisiana.

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

^aOnly 2 striped bass ≥ 30 inches may be retained each day.

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

^cNo length limit for white and black crappie from December 1 – last day of February; all crappie caught must be retained.

Table 3. Stocking history of Toledo Bend Reservoir. Size categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches; ADL = adults. Agencies are: TPWD = Texas Parks and Wildlife Department; LDWF = Louisiana Department of Wildlife and Fisheries; LTX = Texas Lake Association; SRALA = Sabine River Authority of Louisiana; LLA = Louisiana Lake Association.

Species	Year	Number	Size	Agency
Channel catfish	1967	544,745	FGL	TPWD
	Total	544,745		
Flathead catfish	1973	400	FGL	TPWD
	Total	400		
Black crappie	2003	3,655	FGL	LDWF
	Total	3,655		
Striped bass	1971	40,000	N/A	LDWF
	1972	16,250	N/A	LDWF
	1973	182,311	N/A	LDWF
	1974	248,985	N/A	LDWF
	1974	16,000	FGL	TPWD
	1976	366,963	N/A	LDWF
	1976	60,178	FGL	TPWD
	1977	795,580	N/A	LDWF
	1977	100,200	FGL	TPWD
	1978	742,630	N/A	LDWF
	1979	627,799	N/A	LDWF
	1979	95,000	FGL	TPWD
	1980	634,481	N/A	LDWF
	1981	603,502	N/A	LDWF
	1981	96,249	FGL	TPWD
	1982	651,051	N/A	LDWF
	1983	281,944	N/A	LDWF
	1983	104,133	FGL	TPWD
	1984	854,802	N/A	LDWF
	1984	406,920	FGL	TPWD
	1985	757,874	N/A	LDWF
	1985	484,500	FGL	TPWD
	1986	715,379	N/A	LDWF
	1986	203,000	FGL	TPWD
	1987	172,379	N/A	LDWF
	1988	1,053,808	N/A	LDWF
	1988	748,315	FGL	TPWD
1989	422,441	N/A	LDWF	
1990	385,980	N/A	LDWF	
1991	686,610	N/A	LDWF	
1991	240,346	FGL	TPWD	
1992	1,499,956	N/A	LDWF	
1993	282,288	N/A	LDWF	
1994	793,698	N/A	LDWF	
1995	1,531,796	FGL	LDWF	
1995	2,066,500	FRY	LDWF	
1996	698,607	FGL	LDWF	
1996	2,492,000	FRY	LDWF	
1997	264,214	FGL	LDWF	

Table 3 (continued).				
Species	Year	Number	Size	Agency
	1997	549,959	FRY	LDWF
	1998	596,486	FGL	LDWF
	1999	289,304	FGL	LDWF
	2000	498,520	FGL	LDWF
	2001	11,000	FGL	LDWF
	2002	272,179	FGL	TPWD
	2002	69,056	FGL	LDWF
	2003	239,432	FGL	LDWF
	2004	476,788	FGL	LDWF
	2005	82,852	FGL	LDWF
	Total	25,427,393		
Largemouth bass	1967	1,974,000	FGL	TPWD
	1976	229,320	N/A	LDWF
	1987	23,205	FGL	TPWD
	Total	2,226,525		
Florida largemouth bass	1984	214,062	N/A	LDWF
	1985	332,623	FGL	TPWD
	1986	79,000	N/A	LDWF
	1988	150,000	FGL	TPWD
	1989	150,000	N/A	LTX
	1990	100,000	N/A	LDWF
	1990	40,000	N/A	SRALA
	1990	446,797	FRY	TPWD
	1991	358,320	N/A	LDWF
	1991	125,000	N/A	SRALA
	1991	207,291	FRY	TPWD
	1991	194,714	FGL	TPWD
	1992	133,000	N/A	LDWF
	1992	420,000	N/A	SRALA
	1992	406,497	FGL	TPWD
	1993	47,000	N/A	LDWF
	1993	547,448	N/A	SRALA
	1993	65,000	N/A	LLA
	1993	1,616,523	FRY	TPWD
	1993	204,653	FGL	TPWD
	1994	146,750	N/A	LDWF
	1994	492,464	N/A	SRALA
	1994	100,000	N/A	LLA
	1994	733,997	FRY	TPWD
	1994	370,104	FGL	TPWD
	1995	400,007	FGL	TPWD
	1995	109,200	FGL	LDWF
	1996	450,015	FGL	TPWD
	1996	75,000	FRY	LDWF
	1997	234,875	FGL	TPWD
	1997	50,394	FRY	LDWF
	1998	400,735	FGL	TPWD
	1998	4,000	FGL	LDWF
	1998	51,600	FRY	LDWF
	1999	1,206,777	FGL	TPWD

Table 3 (continued).				
Species	Year	Number	Size	Agency
	1999	51,500	FRY	SRALA
	1999	325,000	FGL	LDWF
	2000	500,000	FGL	TPWD
	2000	533,347	FGL	SRALA
	2000	50,050	FGL	LDWF
	2000	500,899	FGL	LDWF
	2000	66,075	FGL	LLA
	2001	508,505	FGL	TPWD
	2001	138,242	FGL	SRALA
	2001	462,289	FGL	LDWF
	2002	740,373	FGL	TPWD
	2002	501,749	FGL	LDWF
	2003	758,405	FGL	TPWD
	2003	459,868	FGL	LDWF
	2004	474,138	FGL	TPWD
	2004	584,724	FGL	LDWF
	2004	10,000	AFGL	LLA
	2005	849,436	FGL	TPWD
	2005	195,095	FGL	LDWF
	Total	18,373,541		

Table 4. Survey of aquatic vegetation, Toledo Bend Reservoir, Texas (71,000 surface acres), 2000 – 2005. Acreage of each species and percent of Texas surface area coverage (in parentheses) are presented.

Species	2000	2001	2002	2003	2004	2005
Alligatorweed				26 (<1)		
American lotus	2,375 (3)	2,375 (3)	540 (1)	101 (<1)	1,260 (2)	842 (1)
Buttonbush					Trace	
Cattail				Trace		
Coontail	3,800 (5)	3,800 (5)	400 (1)	76 (<1)	229 (<1)	140 (<1)
Eelgrass	675 (1)	675 (1)	30 (<1)	11 (<1)		Trace
Eurasian watermilfoil	3,300 (4)	3,800 (5)	115 (<1)	342 (<1)	2,124 (3)	390 (<1)
Fanwort					Trace	
Giant salvinia	115 (<1)	10 (<1)	68 (<1)	124 (<1)	3,070 (4)	281 (<1)
Hydrilla	24,575 (32)	9,830 (13)	2,561 (3)	1,631 (2)	2,109 (3)	1,516 (2)
<i>Ludwigia</i> spp.			50 (<1)	279 (<1)	Trace	Trace
Muskgrass			20 (<1)	33 (<1)		60 (<1)
Parrot's feather	348 (<1)	348 (<1)				
<i>Potamogeton</i> spp.			76 (<1)	56 (<1)	826 (1)	Trace
<i>Sagittaria</i> spp.	Trace	Trace	Trace	Trace		
<i>Scirpus</i> spp.	Trace	Trace	Trace	Trace	Trace	
Smartweed					Trace	
Torpedograss	490 (1)	675 (1)			29 (<1)	Trace
Water fern		Trace				
Water hyacinth	275 (<1)	375 (<1)	345 (<1)	1,025 (2)	2,016 (3)	408 (<1)
White water lily	26 (<1)	26 (<1)	40 (<1)	48 (<1)	100 (<1)	Trace
Grand total	35,979 (51)	21,914 (31)	4,246 (5)	3,753 (5)	11,763 (17)	3,639 (5)

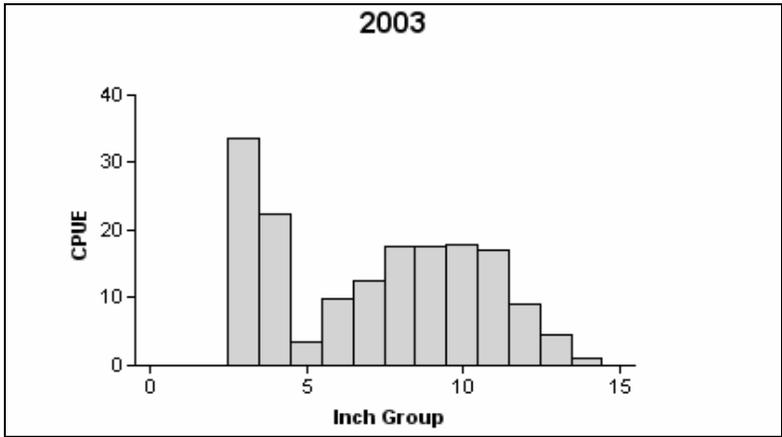
Table 5. Percent directed angler effort by species or groups for Toledo Bend Reservoir, Texas, 2003 – 2006.

Species groups	Year		
	2003/2004	2004/2005	2005/2006
Catfishes	1.5	2.5	1.5
White bass	1.3	0.7	0.1
Yellow bass	0.0	0.0	1.9
Striped bass	0.6	0.0	0.6
Sunfishes	3.3	0.5	2.2
Black basses	73.2	74.4	67.4
Crappie	19.9	19.9	21.7
Anything	0.3	0.9	4.0

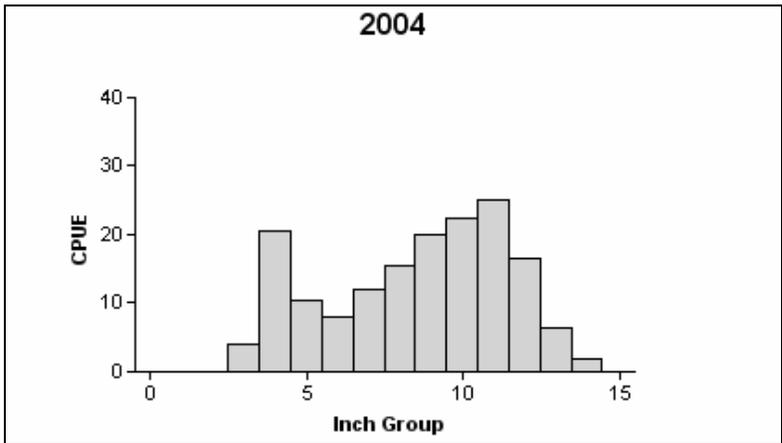
Table 6. Total fishing effort (h) for all species and total directed expenditures at Toledo Bend Reservoir, Texas, 2003- 2006.

Creel statistic	Year		
	2003/2004	2004/2005	2005/2006
Total fishing effort	528,697	497,692	363,835
Total directed expenditures	\$4,072,318	\$3,470,830	\$2,592,065

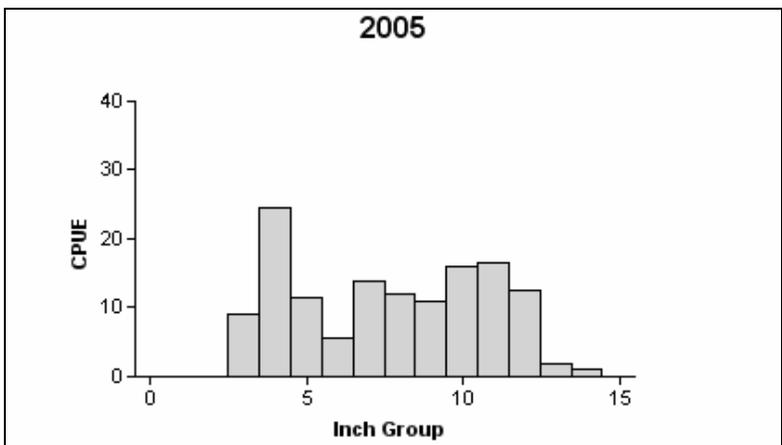
Gizzard Shad



Effort = 2.0
 Total CPUE = 166.5 (28; 333)
 Stock CPUE = 97.0 (19; 194)
 PSD = 32.0 (0.07)
 IOV = 49.25 (0.13)



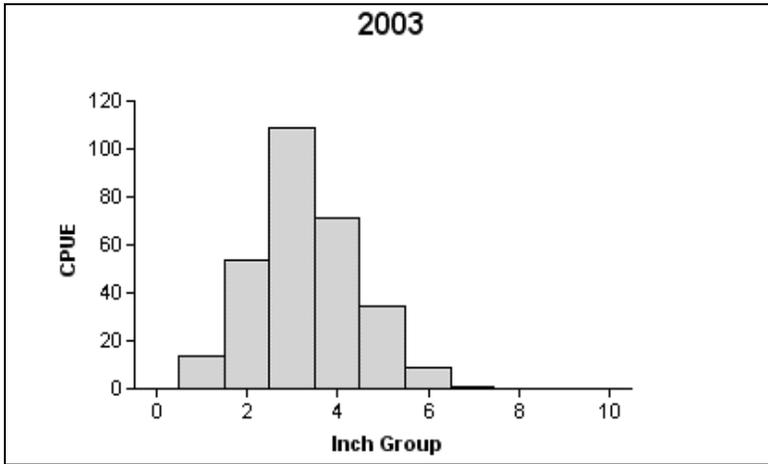
Effort = 2.0
 Total CPUE = 163.0 (16; 326)
 Stock CPUE = 120.0 (16; 240)
 PSD = 42.0 (0.07)
 IOV = 33.74 (0.07)



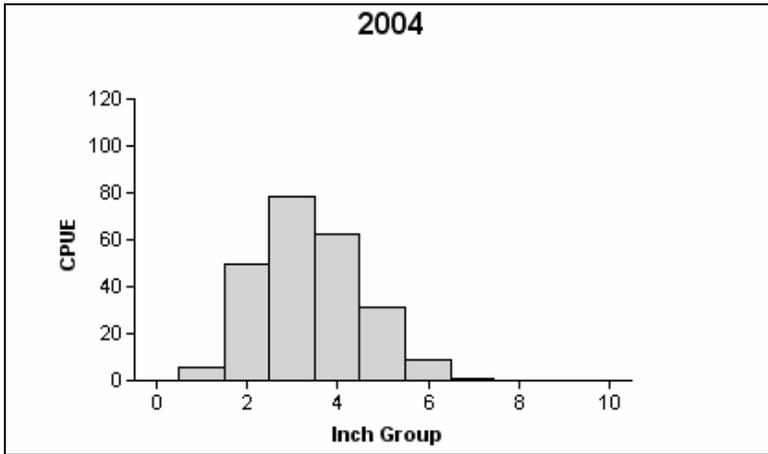
Effort = 2.0
 Total CPUE = 135.5 (24; 271)
 Stock CPUE = 85.0 (25; 170)
 PSD = 38.0 (0.06)
 IOV = 47.6 (0.07)

Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure and IOV are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2003, 2004, and 2005.

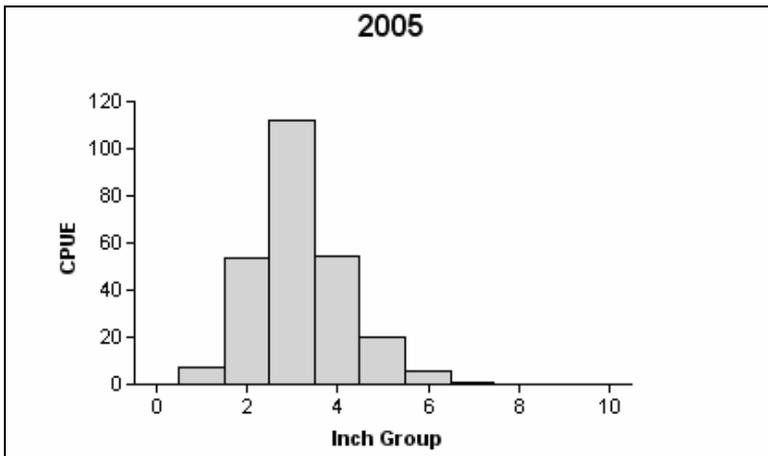
Bluegill



Effort = 2.0
 Total CPUE = 291.0 (17; 582)
 Stock CPUE = 223.5 (14; 447)
 PSD = 4.0 (0.02)



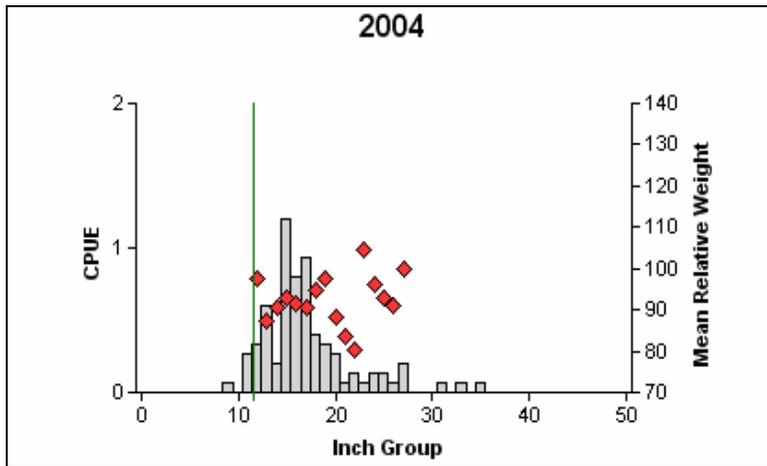
Effort = 2.0
 Total CPUE = 236.5 (15; 473)
 Stock CPUE = 181.0 (13; 362)
 PSD = 5.0 (0.01)



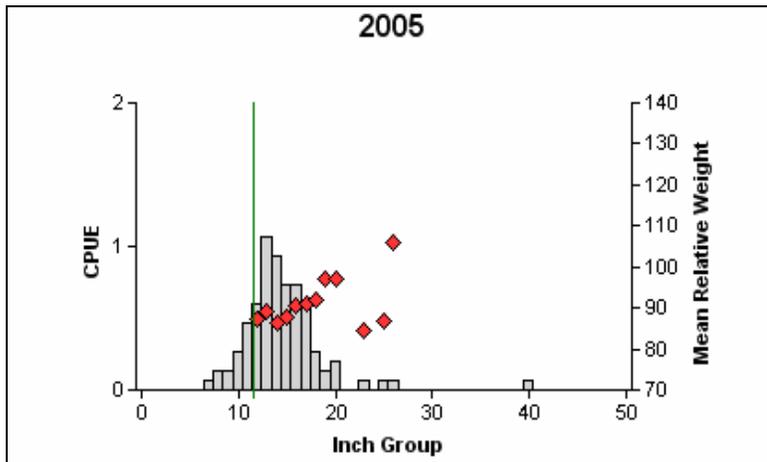
Effort = 2.0
 Total CPUE = 253.5 (16; 507)
 Stock CPUE = 192.5 (17; 385)
 PSD = 3.0 (0.01)

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, 2003, 2004, and 2005.

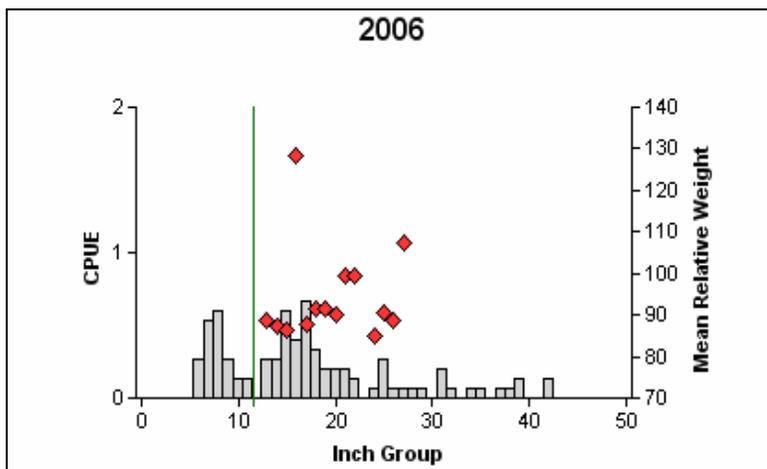
Blue Catfish



Effort = 15.0
 Total CPUE = 6.4 (16; 96)
 Stock CPUE = 6.1 (16; 91)
 PSD = 21.0 (0.06)



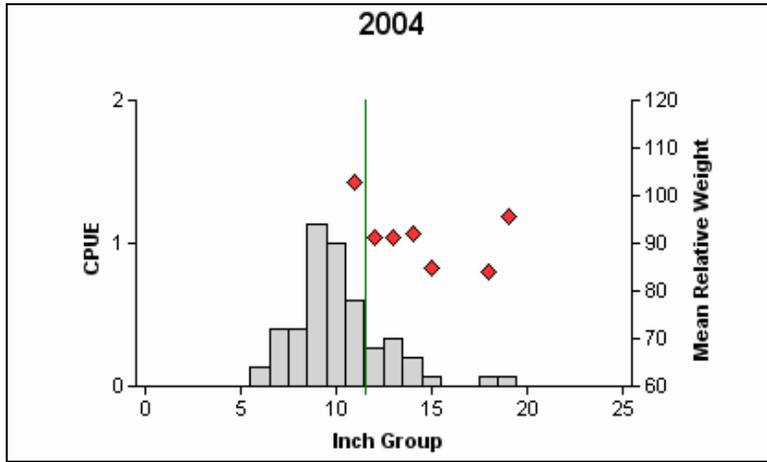
Effort = 15.0
 Total CPUE = 6.6 (19; 99)
 Stock CPUE = 5.5 (14; 83)
 PSD = 8.0 (0.04)



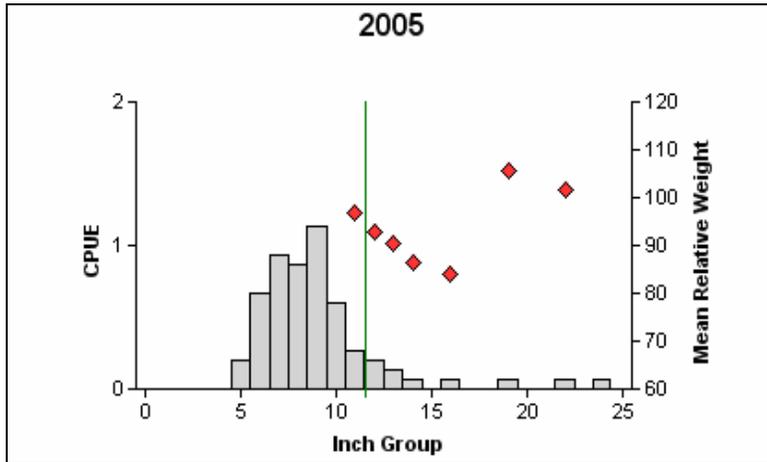
Effort = 15.0
 Total CPUE = 6.6 (27; 99)
 Stock CPUE = 4.7 (19; 70)
 PSD = 41.0 (0.11)

Figure 4. Number of blue catfish caught per net night (CPUE) 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, 2004, 2005, and 2006.

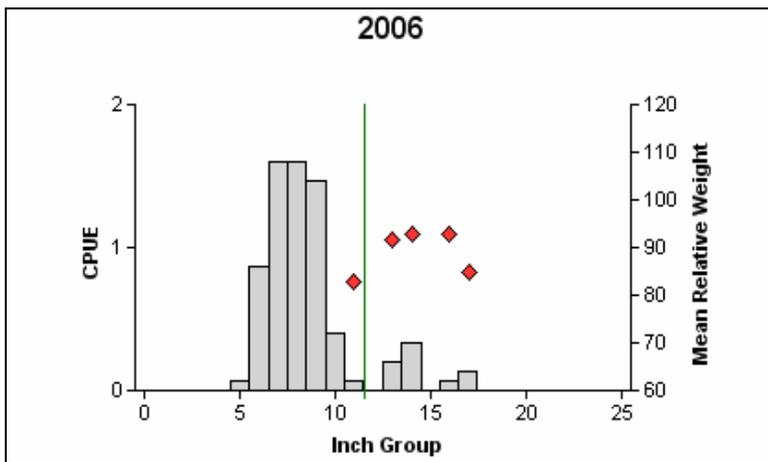
Channel Catfish



Effort = 15.0
 Total CPUE = 4.7 (24; 70)
 Stock CPUE = 1.6 (18; 24)
 PSD = 8.0 (0.05)



Effort = 15.0
 Total CPUE = 5.3 (23; 80)
 Stock CPUE = .9 (18; 14)
 PSD = 29.0 (0.14)



Effort = 15.0
 Total CPUE = 6.8 (64; 102)
 Stock CPUE = .8 (24; 12)
 PSD = 25.0 (0.12)

Figure 5. Number of channel catfish caught per net night (CPUE) 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, 2004, 2005, and 2006.

Catfishes

Table 7. Creel survey statistics for catfishes at Toledo Bend Reservoir from June 2003 - May 2004, June 2004 - May 2005, and June 2005 - May 2006, where total catch per hour is for rod and reel 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		
	2003/2004	2004/2005	2005/2006
Directed effort (h)	7,821.39 (33)	12,358.20 (28)	5,511.74 (41)
Directed effort/acre	0.11 (33)	0.17 (28)	0.08 (41)
Total catch per hour	3.16 (70)	2.77 (71)	1.81 (33)
Total harvest	18,177.20 (173)	32,614.41 (148)	18,276.66 (146)
Harvest/acre	0.26 (173)	0.46 (148)	0.26 (146)
Percent legal released	0	0	2

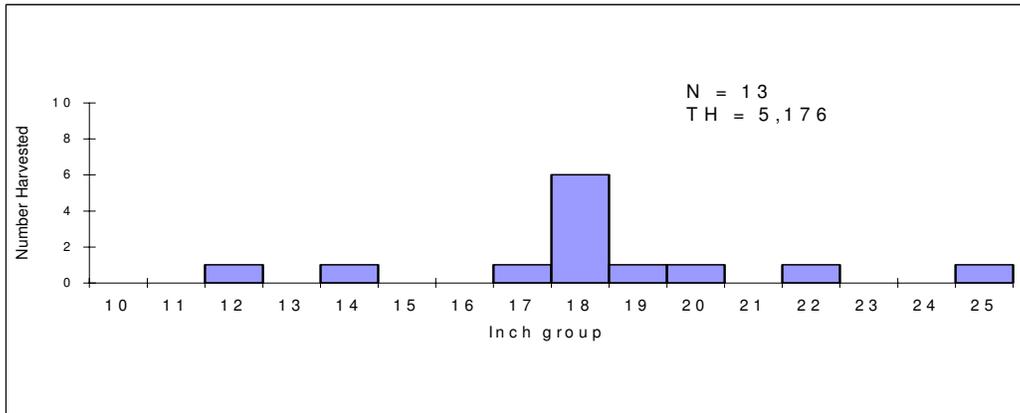


Figure 6. Length frequency of harvested blue catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

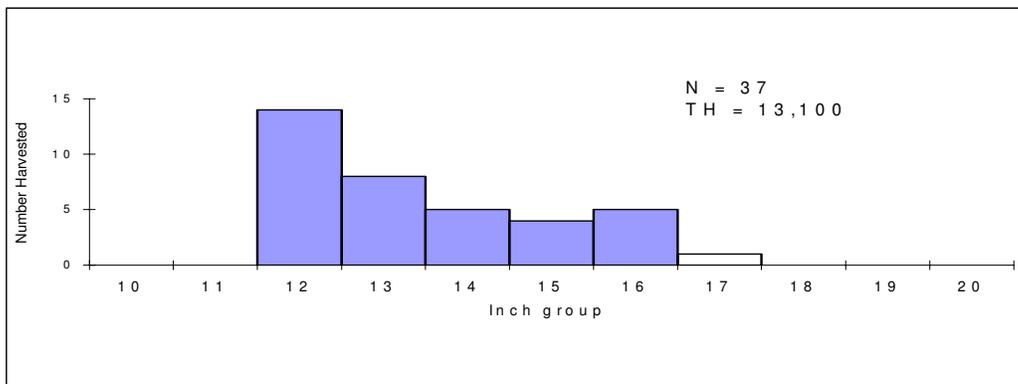


Figure 7. Length frequency of harvested channel catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

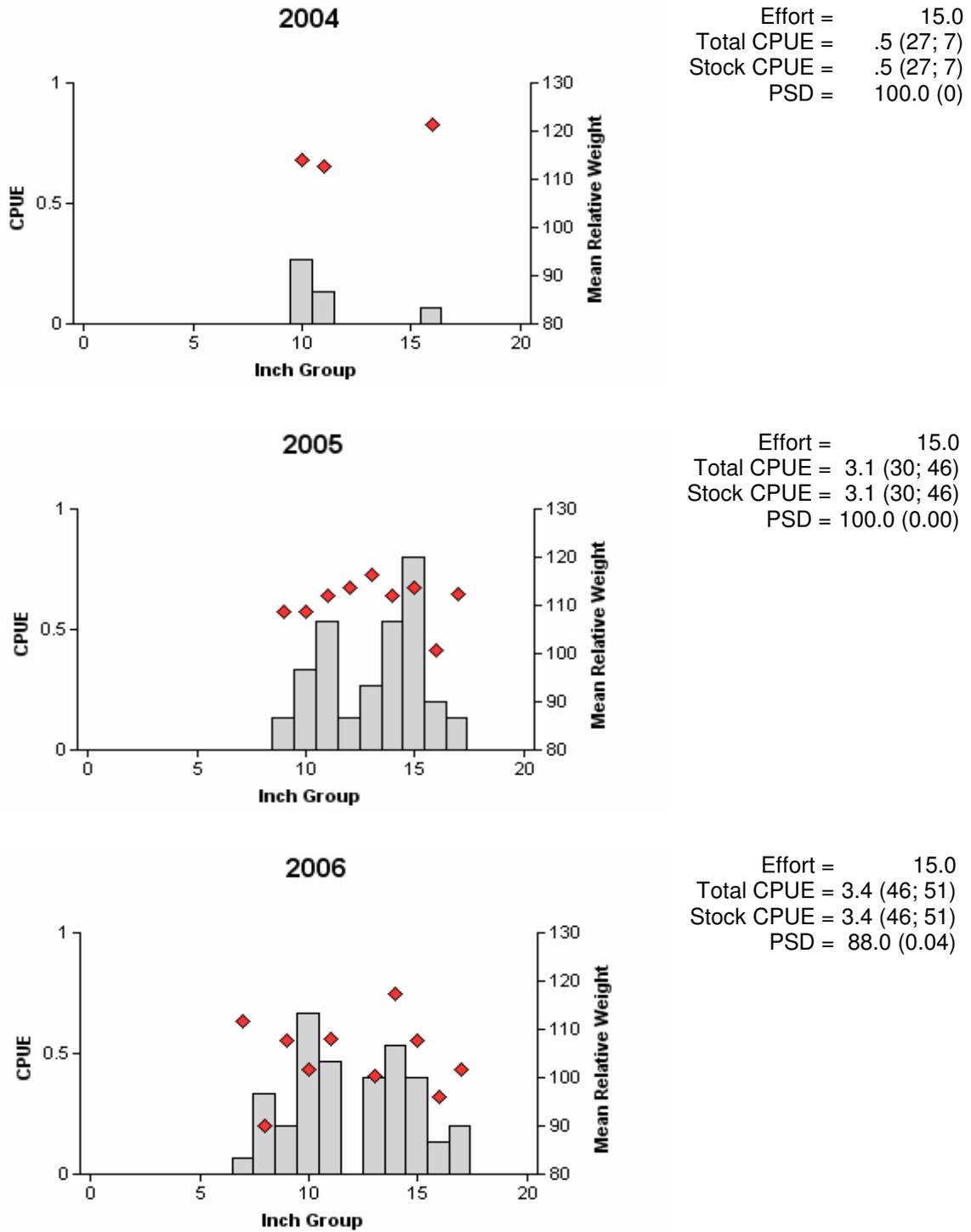


Figure 8. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2004, 2005, and 2006.

White Bass

Table 8. Creel survey statistics for white bass at Toledo Bend Reservoir from June 2003 - May 2004, June 2004 - May 2005, and June 2005 - May 2006, where total catch per hour is for anglers targeting white bass and total harvest is the estimated number of white bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2003/2004	2004/2005	2005/2006
Directed effort (h)	6,669.30 (53)	1,724.08 (64)	459.85 (138)
Directed effort/acre	0.09 (53)	0.02 (64)	<0.01 (138)
Total catch per hour	1.22 (66)	0.36 (.)	12.75 (.)
Total harvest	9,837.97 (166)	5,261.85 (261)	22,659.22 (100)
Harvest/acre	0.13 (166)	0.07 (261)	0.32 (100)
Percent legal released	8	3	30

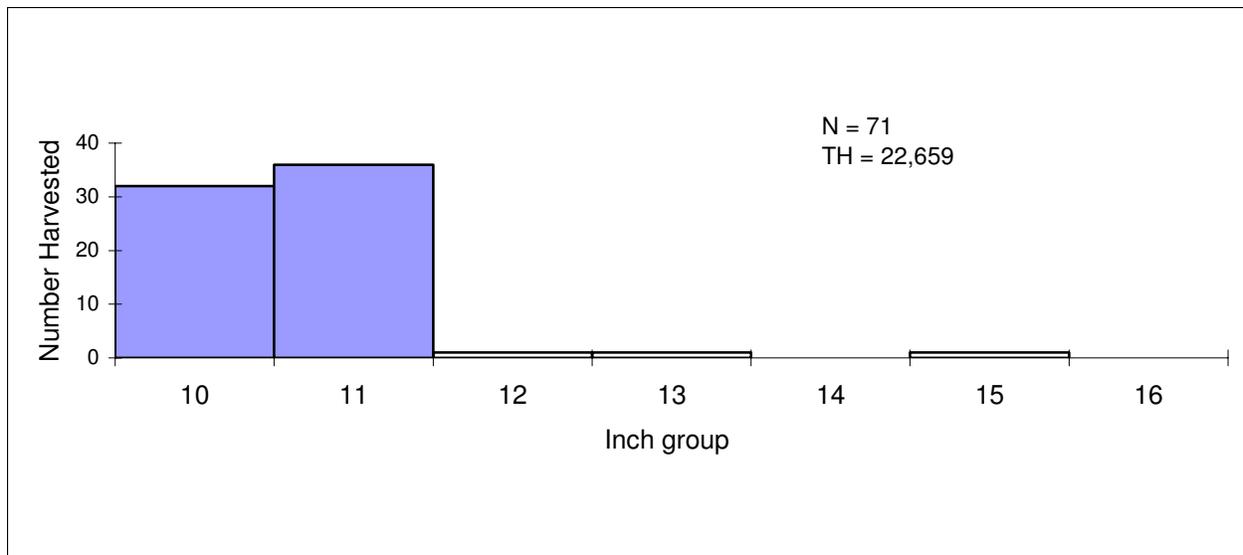


Figure 9. Length frequency of harvested white bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Yellow Bass

Table 9. Creel survey statistics for yellow bass at Toledo Bend Reservoir from June 2003 - May 2004, June 2004 - May 2005, and June 2005 - May 2006, 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		
	2003/2004	2004/2005	2005/2006
Directed effort (h)		2,608.90 (51)	6,759.33 (56)
Directed effort/acre		0.04 (51)	0.10 (56)
Total catch per hour		3.99 (33)	7.85 (90)
Total harvest	1,405.60 (884)	20,751.53 (86)	67,136.21 (59)
Harvest/acre	0.02 (884)	0.29 (86)	0.95 (59)
Percent legal released	5	27	0

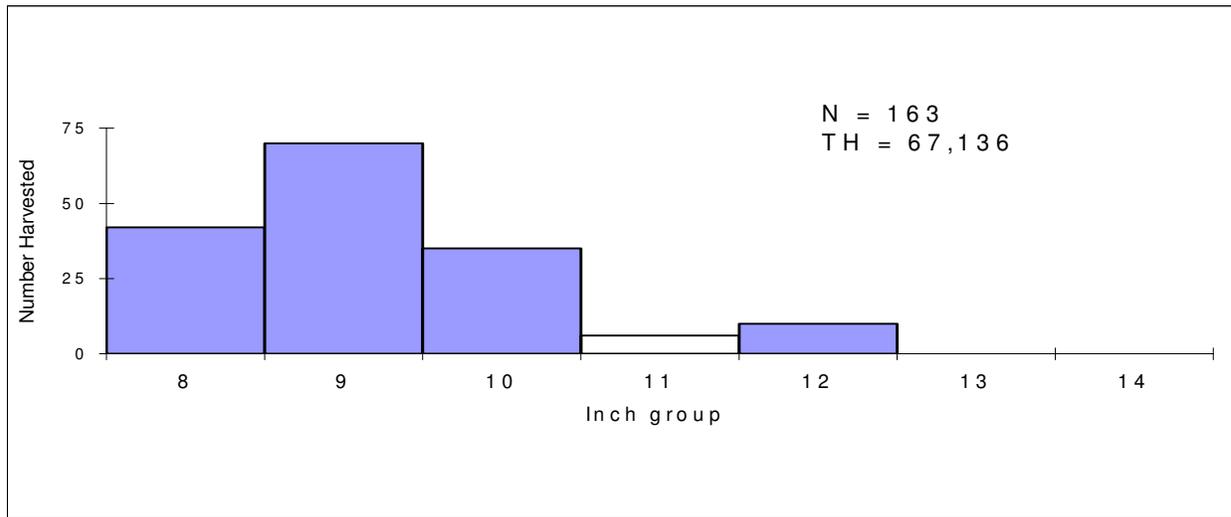
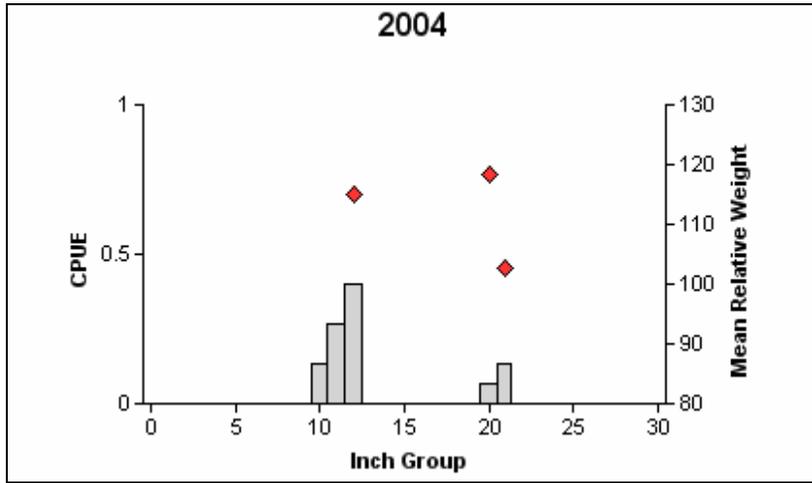
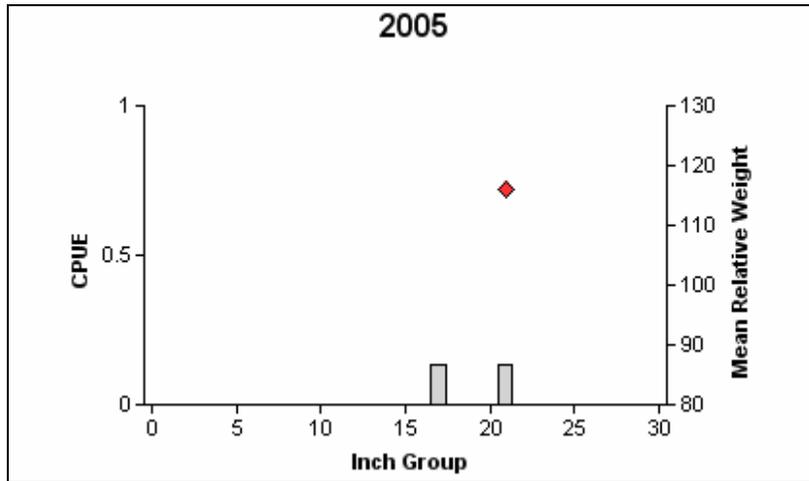


Figure 10. Length frequency of harvested yellow bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested yellow bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Striped Bass



Effort = 15.0
 Total CPUE = 1.0 (59; 15)
 Stock CPUE = .6 (44; 9)
 PSD = 33.0 (0.25)



Effort = 15.0
 Total CPUE = .3 (-99; 4)
 Stock CPUE = .3 (-99; 4)
 PSD = 50.0 (0.00)

Figure 11. Number of striped bass caught per net night (CPUE) 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, 2004 and 2005. No fish were collected in 2006.

Striped Bass

Table 10. Creel survey statistics for striped bass at Toledo Bend Reservoir from June 2003 - May 2004, June 2004 - May 2005, and June 2005 - May 2006, 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.

Creel Survey Statistic	Year		
	2003/2004	2004/2005	2005/2006
Directed effort (h)	3,144.21 (50)		2421.01 (63)
Directed effort/acre	0.04 (50)		0.03 (63)
Total catch per hour	0.02 (.)		0.70 (90)
Total harvest	192.72 (1,318)	506.45 (1,692)	1,627.58 (300)
Harvest/acre	<0.01 (1,318)	<0.01 (1,692)	0.02 (300)
Percent legal released	79	0	0

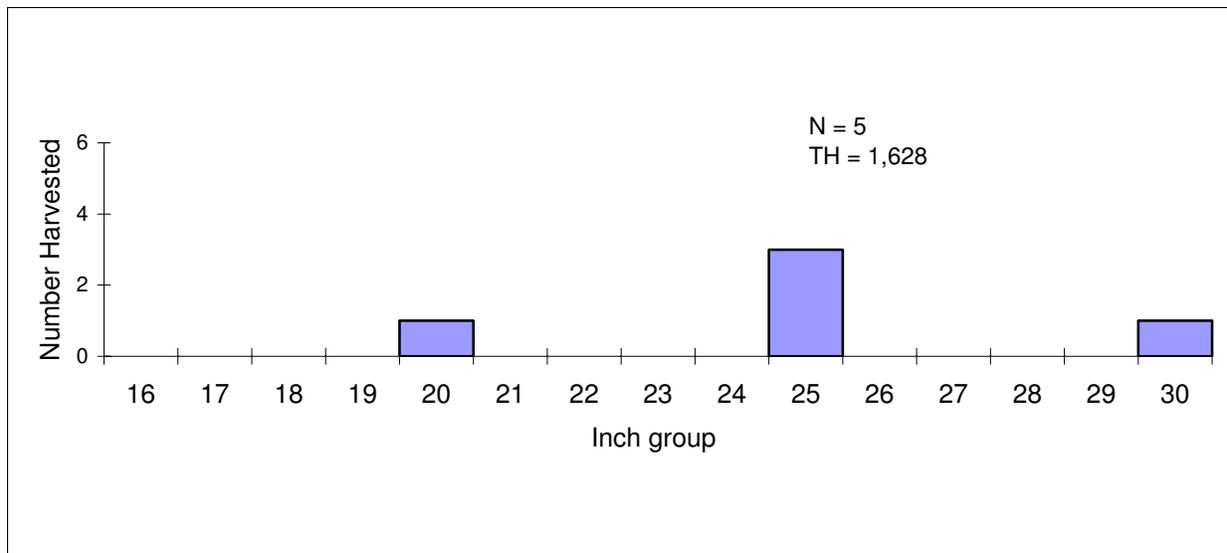
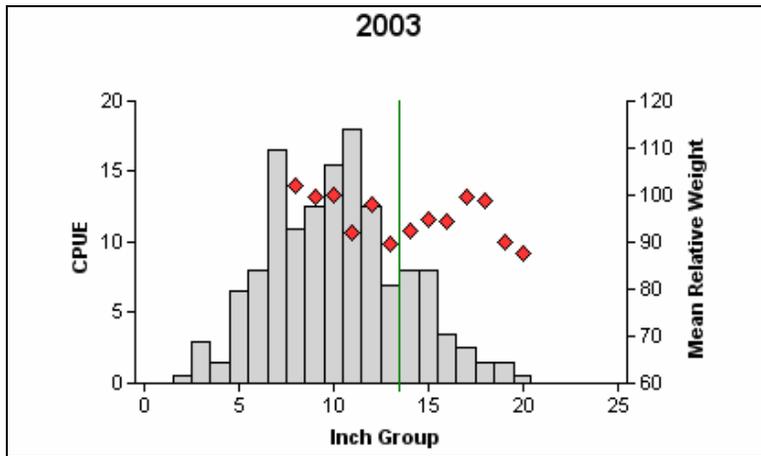
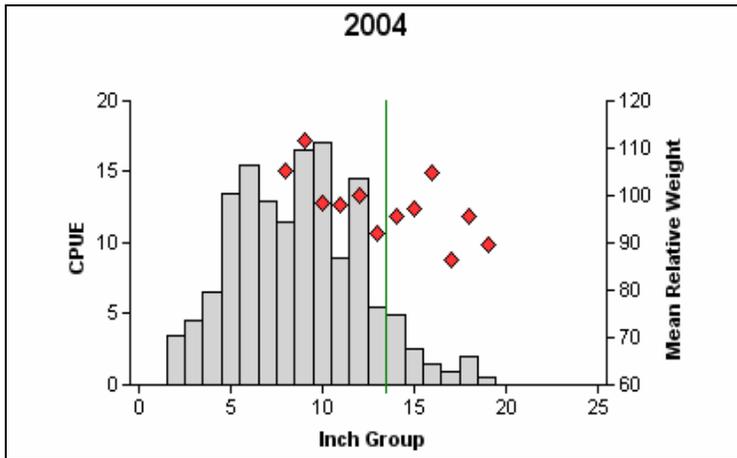


Figure 12. Length frequency of harvested striped bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested striped bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

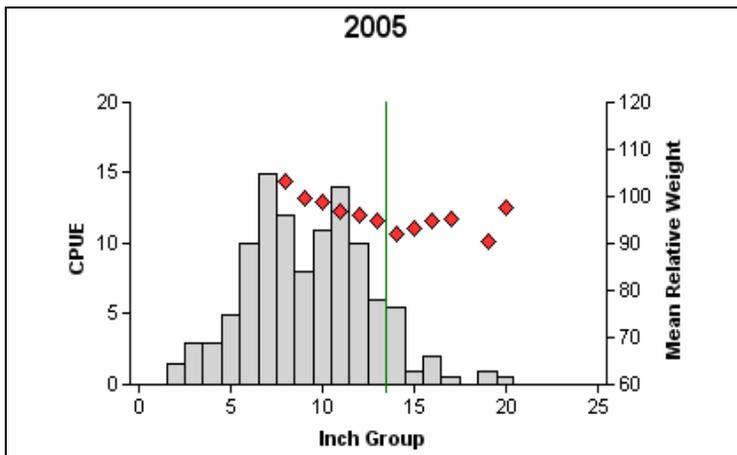
Largemouth Bass



Effort = 2.0
 Total CPUE = 138.0 (14; 276)
 Stock CPUE = 102.0 (13; 204)
 PSD = 44.0 (0.04)
 RSD-14 = 25.0 (0.03)



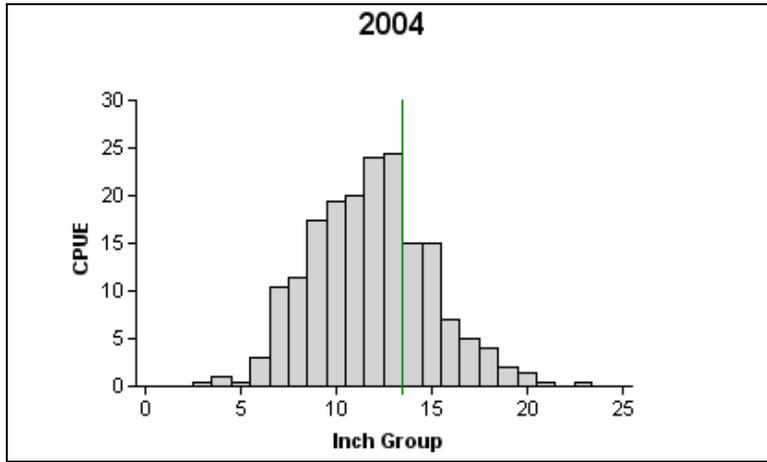
Effort = 2.0
 Total CPUE = 143.0 (12; 286)
 Stock CPUE = 86.5 (14; 173)
 PSD = 38.0 (0.05)
 RSD-14 = 14.0 (0.03)



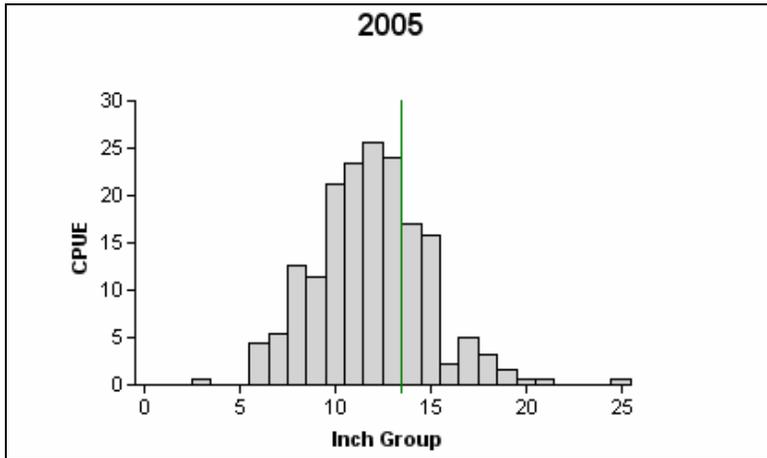
Effort = 2.0
 Total CPUE = 109.0 (15; 218)
 Stock CPUE = 71.5 (18; 143)
 PSD = 37.0 (0.05)
 RSD-14 = 15.0 (0.03)

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, 2003, 2004, and 2005.

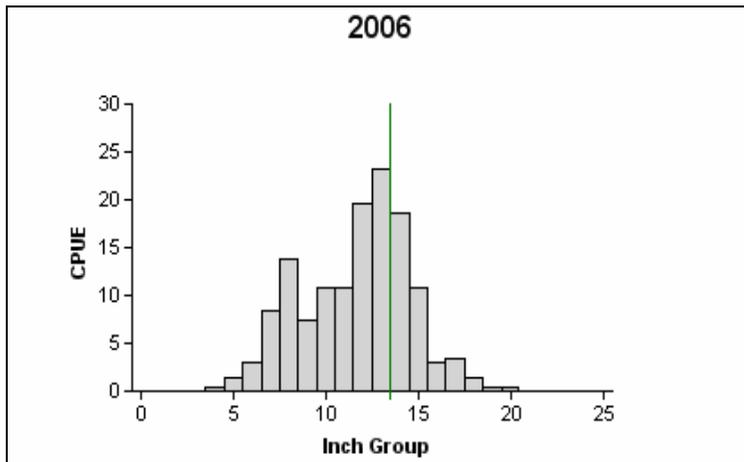
Largemouth Bass



Effort = 2.0
 Total CPUE = 183.0 (9; 366)
 Stock CPUE = 167.5 (9; 335)
 PSD = 59.0 (0.04)
 RSD-14 = 30.0 (0.04)



Effort = 1.8
 Total CPUE = 175.1 (10; 321)
 Stock CPUE = 164.7 (10; 302)
 PSD = 58.0 (0.04)
 RSD-14 = 28.0 (0.04)



Effort = 2.0
 Total CPUE = 137.2 (12; 279)
 Stock CPUE = 123.9 (11; 252)
 PSD = 65.0 (0.04)
 RSD-14 = 31.0 (0.02)

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, 2004, 2005, and 2006.

Black Basses

Table 11. Creel survey statistics for black basses at Toledo Bend Reservoir from June 2003 - May 2004, June 2004 - May 2005, and June 2005 - May 2006, 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		
	2003/2004	2004/2005	2005/2006
Directed effort (h)	385,064.62 (33)	370,126.56 (15)	244,805.51 (17)
Directed effort/acre	5.42 (33)	5.21 (15)	3.45 (17)
Total catch per hour	0.78 (12)	0.99 (11)	0.78 (22)
Total harvest	123,871.73 (32)	121,181.48 (26)	135,370.55 (32)
Harvest/acre	1.74 (32)	1.71 (26)	1.91 (32)
Percent legal released	17	17	31

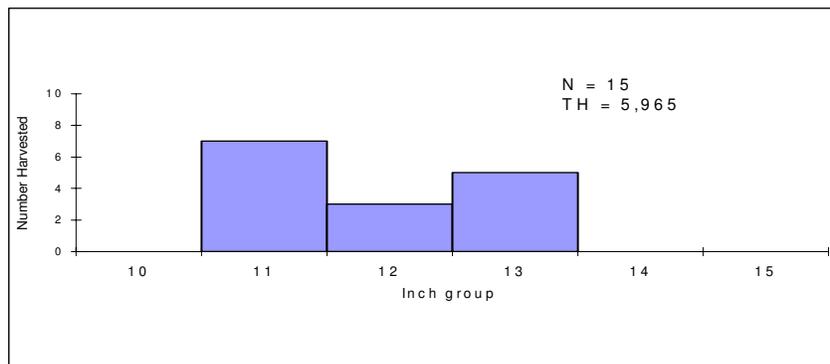


Figure 15. Length frequency of harvested spotted bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

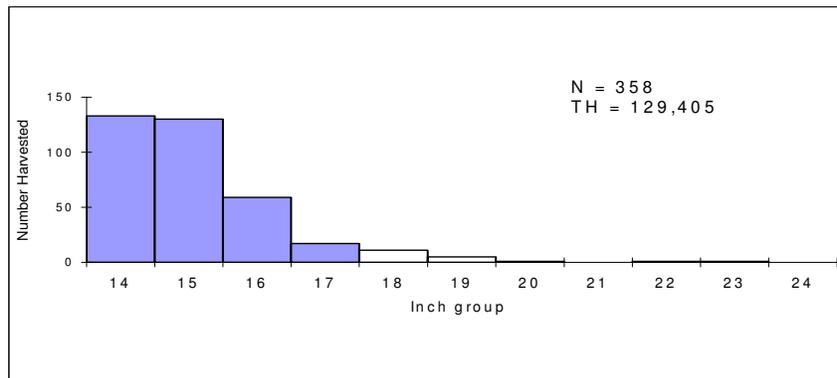


Figure 16. Length frequency of harvested largemouth bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 12. Results of genetic analysis of largemouth bass collected by fall electrofishing, Toledo Bend Reservoir, Texas, 2002 - 2005. 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.

Year	Sample size	Genotype				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
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

^aEmbayment sample

Crappie

Table 13. Creel survey statistics for crappie at Toledo Bend Reservoir from June 2003 - May 2004, June 2004 - May 2005, and June 2005 - May 2006, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2003/2004	2004/2005	2005/2006
Directed effort (h)	104,471.09 (25)	99,011.49 (16)	78,606.68 (18)
Directed effort/acre	1.47 (25)	1.39 (16)	1.11 (18)
Total catch per hour	1.72 (29)	2.00 (31)	1.91 (23)
Total harvest	158,429.42 (44)	178,660.64 (32)	185,190.72 (36)
Harvest/acre	2.23 (44)	2.52 (32)	2.61 (36)
Percent legal released	<1	0	4

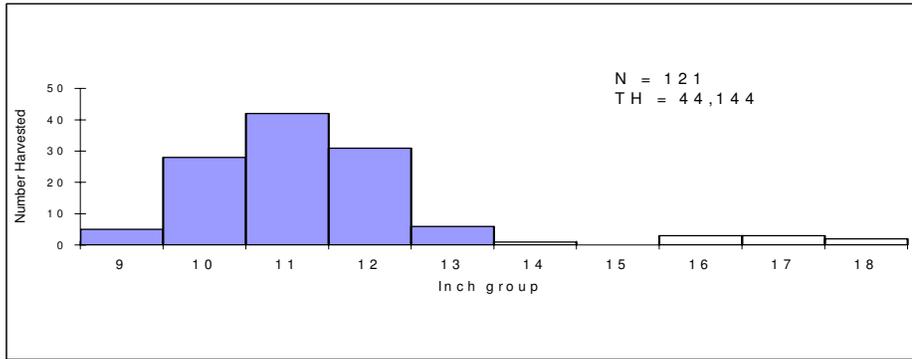


Figure 17. Length frequency of harvested white crappie observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested white crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

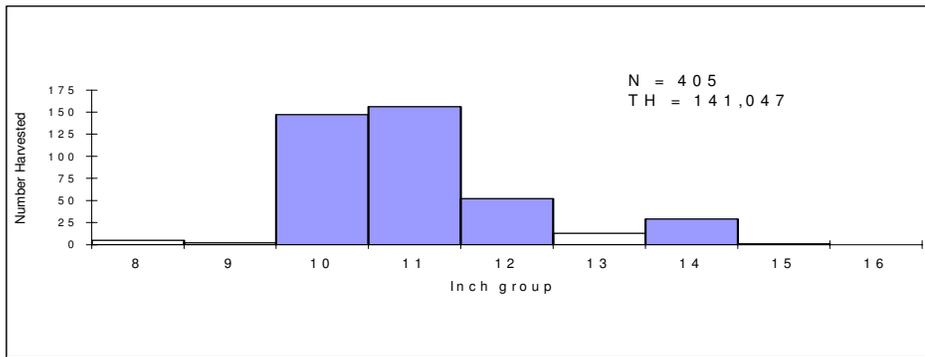


Figure 18. Length frequency of harvested black crappie observed during creel surveys at Toledo Bend Reservoir, Texas, June 2005 - May 2006, all anglers combined. N is the number of harvested black crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

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

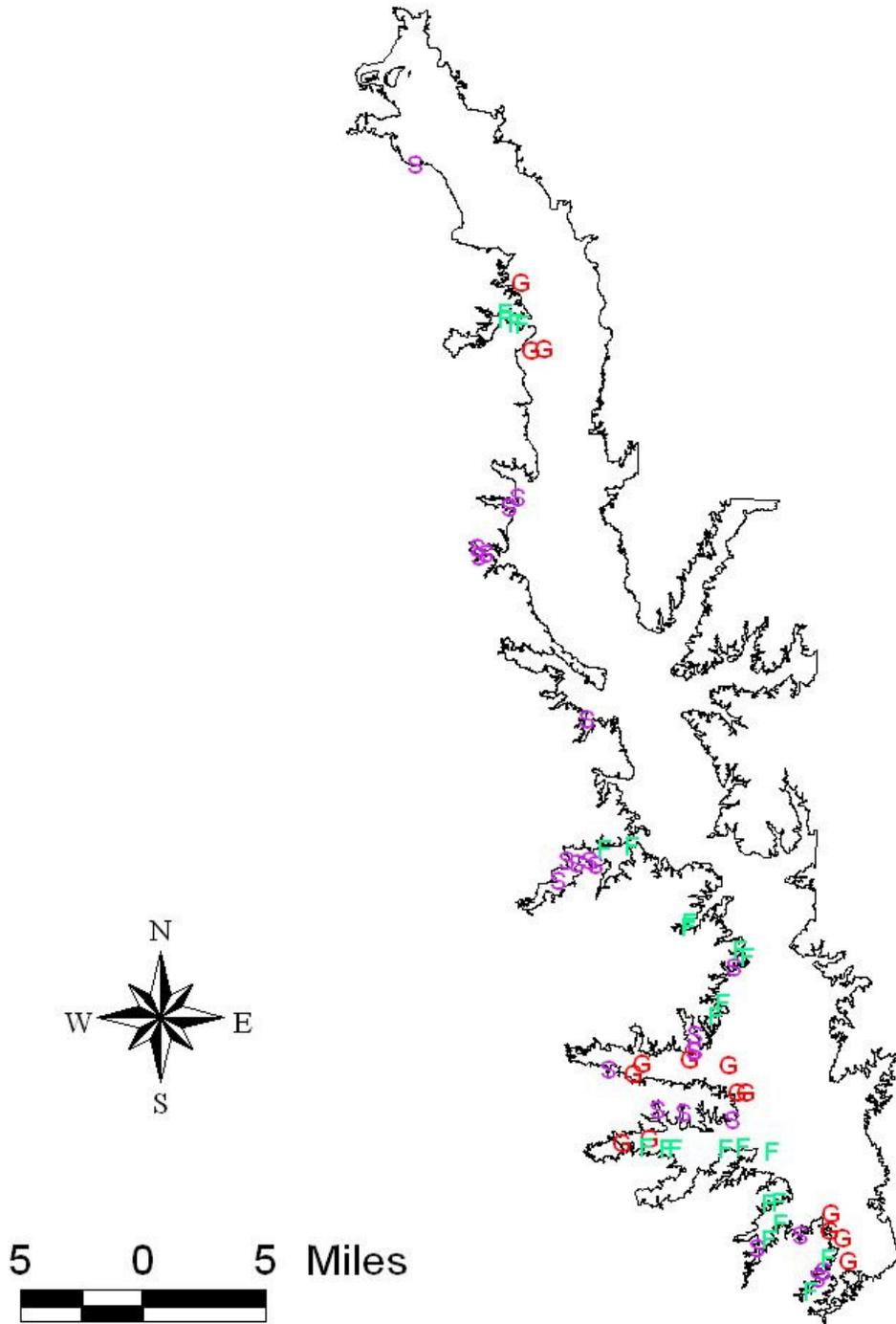
Survey Year	Electrofisher	Gill Net	Creel Survey	Vegetation	Report
2006-2007	A, A		A	A	
2007-2008	S, A	S	A	S	S
2008-2009	A, A		A	A	
2009-2010	A, A	A	A	A	A

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from gill netting and fall electrofishing, Toledo Bend Reservoir, Texas, 2005-2006.

Species	Gill Netting		Fall Electrofishing	
	N	CPUE	N	CPUE
Spotted gar	3	0.2		
Gizzard shad	155	10.3	271	135.5
Threadfin shad			231	115.5
Spotted sucker	8	0.5		
Yellow bullhead	1	0.1		
Brown bullhead	1	0.1		
Blue catfish	99	6.6		
Channel catfish	102	6.8		
White bass	51	3.4		
Yellow bass	54	3.6		
Redbreast sunfish			70	35.0
Warmouth			27	13.5
Bluegill			507	253.5
Longear sunfish			42	21.0
Redear sunfish			179	89.5
Spotted bass	1	0.1	18	9.0
Largemouth bass	19	1.3	218	109.0
White crappie	1	0.1		
Black crappie	67	4.5		
Freshwater drum	5	0.3		

APPENDIX B



Location of sampling sites, Toledo Bend Reservoir, Texas, 2005-2006. Gill net and spring and fall electrofishing stations are indicated by G, S, and F, respectively. Water level was 4 – 7 feet below full pool at time of sampling.

APPENDIX C

Results from individual and team format bass tournaments at Toledo Bend Reservoir, 2004 - 2005. Only tournaments with 5-fish bag limits and > 50 participants or teams were included. Weights are annual means and 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							
2004	7	18.0	15.7	14.4	2.1	16.6	9.6
2005	1	23.0	21.0	17.0	7.2	22.9	8.0
Team							
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