

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-33

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2007 Survey Report

Abilene Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Abilene Reservoir were surveyed in 2007 using electrofishing and trap nets and in 2008 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Abilene Reservoir is a 640-acre impoundment constructed on Elm Creek in the Brazos River Basin approximately 18 miles south of Abilene, Texas. The reservoir was primarily used for recreation. Beginning in 2005 operation and control of the reservoir was transferred from the city of Abilene to Abilene State Park. From 1997 through 2001 water level fell to record lows with only five acre-feet remaining. Rain events in early 2005 and summer 2007 filled the reservoir. The reservoir has experienced relatively stable water levels since 2005.
- **Management History:** Stockings of blue catfish, channel catfish, and northern largemouth bass occurred following the 1998-2001 drought.
- **Fish Community**
 - **Prey species:** Prey fish abundance was sufficient for available predators.
 - **Catfishes:** Our survey indicated and blue catfish were present but not abundant. Blue catfish have not adapted well to Abilene Reservoir. Channel catfish were moderately abundant
 - **Largemouth bass:** Numbers and size distribution of largemouth bass were excellent and should support above average fishing opportunities for several years. The largemouth bass population was composed almost entirely of northern-strain fish.
 - **White crappie:** Abundance was very high, but relatively few were legal size or longer. Reservoir conditions and forage were such that growth should be fast and size structure should improve.
- **Management Strategies:** Conduct electrofishing and trap net surveys in 2009. Evaluate white crappie age and size structure in 2009.

INTRODUCTION

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

Reservoir Description

Abilene Reservoir is a 640-acre impoundment constructed on Elm Creek approximately 18 miles south of Abilene, Texas. It is located in the Brazos River Basin, and its primary use was recreation, but it also provided some municipal water supply for the city of Abilene. Beginning in 2005 operation and control of the reservoir was transferred from the city of Abilene to Abilene State Park.

Abilene Reservoir has experienced two severe low-water periods, one in the mid 1980s and one in the late 1990s to early 2000s (Figure 1). From 1986 to the middle of 1997 water levels were relatively stable (Figure 1). From 1997 thru the summer of 2002 there was substantial water loss as the reservoir fell to record lows in 2001 with only five acre-feet remaining in the reservoir. In August 2001 rotenone was applied to the entire reservoir in an attempt to remove existing fish populations. The attempt was not 100% successful. A large rain event in summer 2002 raised the water level 14 feet but, from 2002 to 2004, water level receded another seven feet. Large rain events in early 2005 and summer 2007 filled the reservoir. The reservoir has experienced relatively stable water levels since 2005. Water level was essentially at conservation level at time of sampling, and littoral habitat consisted primarily of flooded-terrestrial vegetation and black willow.

Boat access consisted of two public boat ramps. Bank fishing access was limited to the south shore as Abilene State Park staff continued to work out details regarding access to the north shore. Other descriptive characteristics for Abilene Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Dumont 2004) included:

1. Reestablish forage and sport fish populations when water level approaches conservation level.

Action: Blue catfish and channel catfish were stocked in 2004. Northern largemouth bass were stocked in 2005. Exploratory seining and electrofishing trips in 2005 and 2006 indicated that bluegill, inland silversides, gizzard shad, and white crappie were present in adequate abundance to produce self-sustaining populations.

Harvest regulation history: Fish populations have always been managed with statewide harvest regulations at Abilene Reservoir. Harvest regulations for sport fish in Abilene Reservoir are in Table 2.

Stocking history: Fingerling bluegill were stocked in late September 2001 following the rotenone application. Post-drought stocking consisted of stocking relatively equal numbers of fingerling blue and channel catfish and a stocking of northern largemouth bass. Stocking history prior to 2001 included stockings of Florida largemouth bass in the early 1990s and Imperial channel catfish in 1998 for a research project. A relevant stocking history is in Table 3.

Vegetation/habitat history: Abilene Reservoir has no significant vegetation/habitat management history.

METHODS

Fishes were collected by electrofishing (1.33 hours at 16 5-min stations), gill netting (five net nights at five stations), trap netting (10 net nights at 10 sites), and hoop netting (three units of effort where each unit of effort was a series of three hoop nets in tandem fished for three nights). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing, for gill and trap nets as the number of fish per net night (fish/nn), and for hoop nets as the number of fish per hoop net series fished for three nights (fish/series). Microsatellite DNA analysis was used in 2007 and electrophoresis was used prior to 2007 to determine largemouth bass genetics; adult fish (≥ 10 inches TL) were included in the 2007 genetics sample as too few young-of-the-year bass were collected for meaningful results. 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 Size Distribution (PSD)] (Guy *et al.* 2007), and condition indices [relative weight (W_t)] were calculated for some 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 SE was calculated for structural indices and IOV. Ages of largemouth bass were determined using otoliths. Source for water level data was the United States Geological Survey website.

RESULTS AND DISCUSSION

Habitat: A habitat survey was last conducted in 1996 (Dumont and Munger 1997).

Prey species: Electrofishing CPUE of gizzard shad and bluegill was 505.5/h and 101.3/h, respectively. Gizzard shad IOV ranged from 86-93% from 1999 to 2007, indicating a high proportion of gizzard shad were available to game fish as forage (Figure 2). Bluegill size structure and relative abundance did not change following the drought; the population had low abundance and was dominated by small fish (Figure 3).

Blue catfish: Gill net CPUE of blue catfish was 0.8/nn in 2008, which was similar to the 2001 catch rate but lower than the 2006 catch rate (Figure 4). Size structure was poor in all years with fish ranging in size from 6 to 13 inches (Figure 4). Size of blue catfish shifted from 6-9 inches in 2006 to 11-13 inches in 2008.

Channel catfish: Gill net CPUE of channel catfish was 1.8/nn in 2008, which was similar to the catch rate in 2001 but lower than the catch rate in 2006 (Figure 5). Hoop net CPUE was 48.0/series resulting in a catch of 144 fish, which is substantially higher than the eight fish caught with five gill nets. Size structure from hoop nets consisted primarily of 8- to 10-inch fish, and fish up to 15 inches long were collected (Figure 6).

Largemouth bass: Electrofishing CPUE of largemouth bass was 77.3/h in 2007. Recruitment of a strong year class in 2005 was reflected in the 2007 sample in terms of catch rates of larger fish and an increase in PSD, PSD-14, and PSD-P (Figure 7).

Other indications of a healthy largemouth bass population were body condition and growth. Relative weights in 2007 ranged from 95 to 104 and were higher than the relative weights of fish in 1999 (Table 4). Excellent body condition of stock-length fish in 2005 and all size classes in 2007 reflected essentially new reservoir conditions that have been in place since 2005. Forty largemouth bass from 10.2 to 14.5 inches were aged in 2007; all of them were two years old. Compared to 1999 and 1996, growth was much better in 2007 (Table 5).

Genetic analysis in 2007 indicated that northern-strain largemouth bass dominated the population. Prior to the drought Florida largemouth bass influence was at or near 0% until 1999 when Florida largemouth bass allele frequency increased to 29% (Table 6). After the drought only northern largemouth bass were stocked and Florida largemouth bass allele frequency dropped to 5% in 2007 as percent of northern genotype fish in the population increased from 36% in 1999 to 63% in 2007.

White crappie: Trap net catch rate of white crappie was 43.1/nn in 2007. This was similar to catch rates observed in previous years (Figure 8). Size structure in 2007 lacked quality-sized and legal-sized fish as indicated by a PSD and PSD-10 of 6 and 4, respectively. Whether these smaller fish represented a strong year class in 2006 or 2007 or were part of multiple year classes with slow growth was unknown because fish were not aged. Historically, white crappie growth at Abilene Reservoir was poor; mean age at 10 inches was 5.8 years in 1999 and 4.5 years in 1996. With growth rates this poor, Abilene Reservoir was once considered a possible candidate for removing the 10-in MLL. However, given that current conditions are similar to those found in new reservoirs, it is unlikely that poor size structure is the result of slow growth.

Fisheries management plan for Abilene Reservoir, Texas

Prepared – July 2008.

ISSUE 1: White crappie have a history of poor growth and poor size distribution. The 2007 estimate of white crappie size structure showed that this could be occurring again.

MANAGEMENT STRATEGY

1. Conduct a trap net survey in 2009 with an age-and-growth analysis of the white crappie population.

SAMPLING SCHEDULE JUSTIFICATION:

A trap net survey in 2009 will allow us to further document crappie size and age structure. An electrofishing survey in 2009 will allow us to continue documentation of post-drought recovery of largemouth bass, sunfish, and shad populations. Catfishes can be effectively monitored once every four years using gill nets and hoop nets. A sampling schedule is in Table 7.

6
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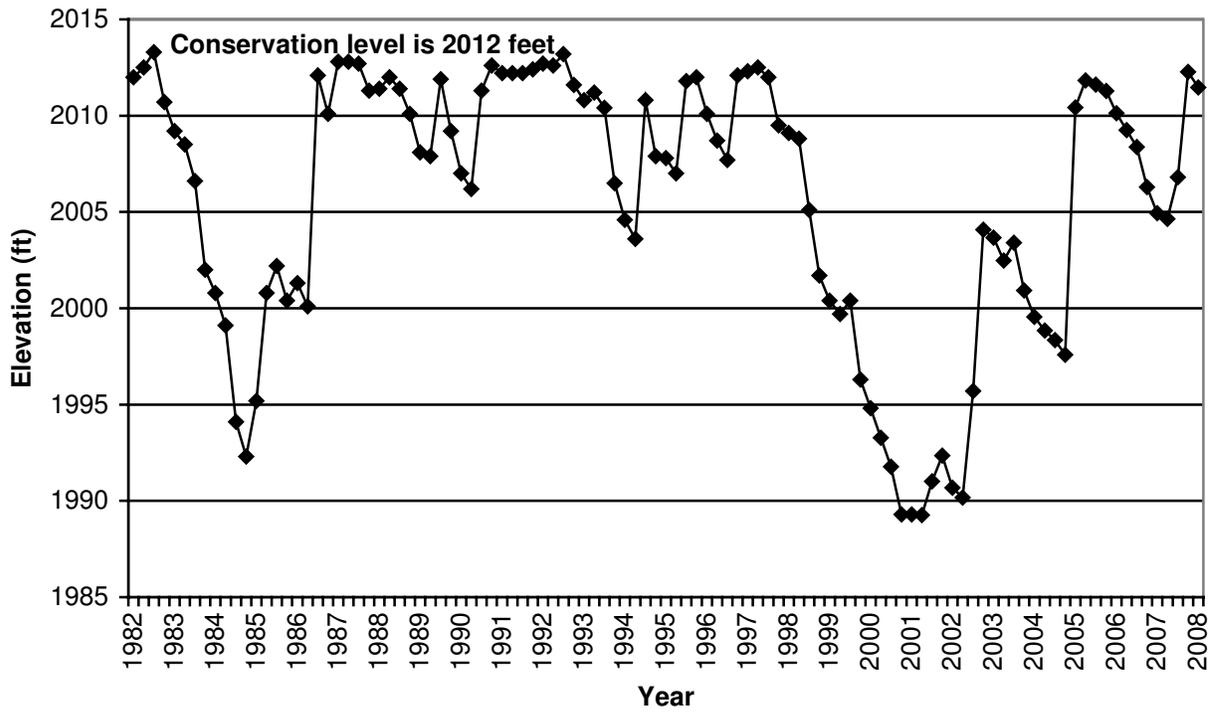


Figure 1. Quarterly water level elevations in feet above mean sea level for Abilene Reservoir, Texas, 1982-2008.

Table 1. Characteristics of Abilene Reservoir, Texas.

Characteristic	Description
Year constructed	1921
Controlling authority	Abilene State Park
County	Taylor
Reservoir type	Tributary, Brazos River Basin
Shoreline Development Index	3.39
Conductivity	467 umhos/cm

Table 2. Harvest regulations for Abilene Reservoir, Texas

Species	Bag Limit	Minimum Length Limit (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12
Catfish, flathead	5	18
Bass, largemouth	5	14
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10

Table 3. Stocking history of Abilene Reservoir, Texas. Size categories are: FGL = 1-3 inches.

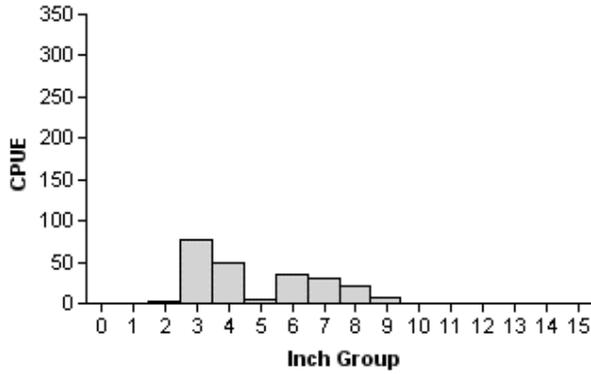
Species	Year	Number	Size
Blue catfish	1995	36,883	FGL
	1996	64,429	FGL
	2004	59,893	FGL
	Total	161,205	
Channel catfish	1998*	19,362	FGL
	2004	53,981	FGL
	2005	401	FGL
	Total	73,744	
Bluegill	2001	81,238	FGL
Largemouth bass	2005	63,695	FGL
Florida largemouth bass	1988	64,000	FGL
	1991	30,030	FGL
	1994	64,026	FGL
	Total	158,056	

* Imperial strain

Gizzard Shad

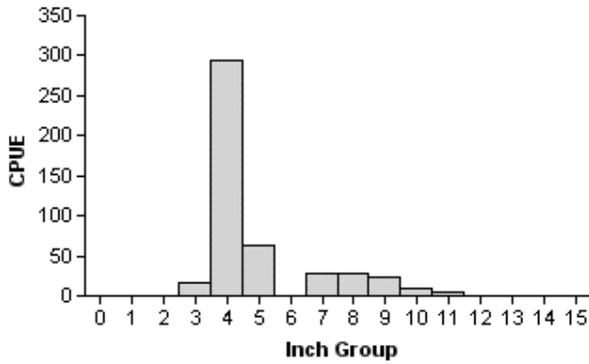
1999

Effort = 1.0
 Total CPUE = 223.0 (17; 223)
 PSD = 0
 IOV = 88 (4)



2005

Effort = 0.9
 Total CPUE = 468.0 (44; 429)
 PSD = 6 (5)
 IOV = 86 (7)



2007

Effort = 1.3
 Total CPUE = 505.5 (13; 674)
 PSD = 2 (1)
 IOV = 93 (3)

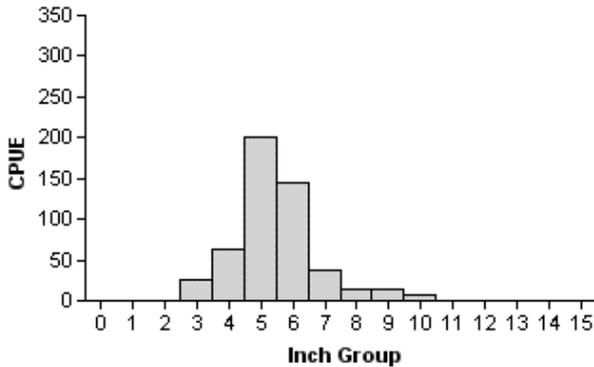
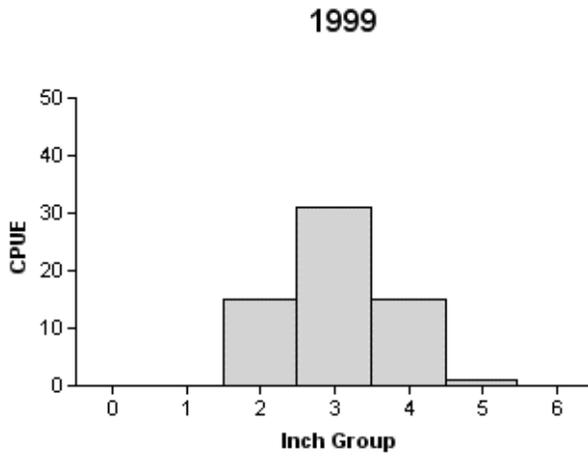
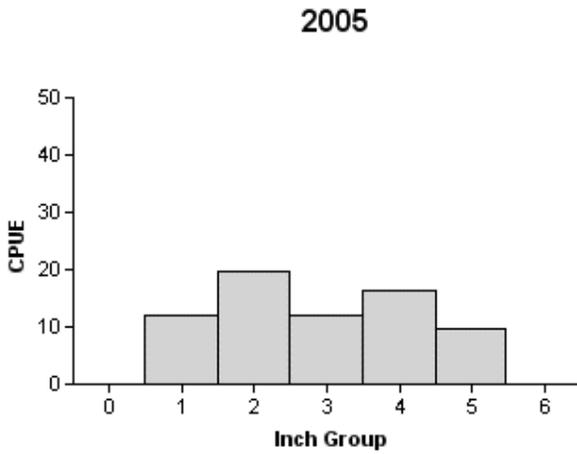


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for PSD and IOV are in parentheses) for fall electrofishing surveys, Abilene Reservoir, Texas, 1999, 2005, and 2007.

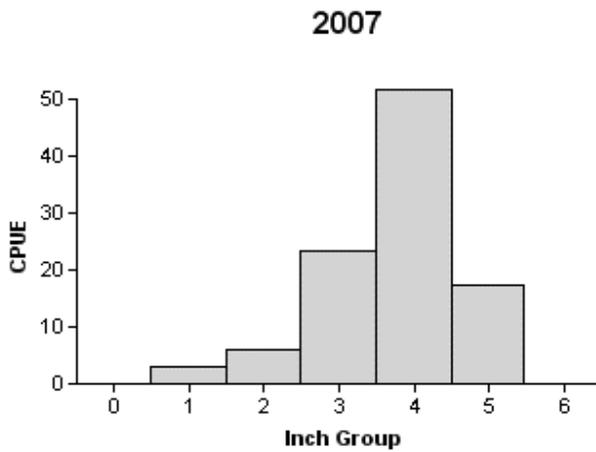
Bluegill



Effort = 1.0
 Total CPUE = 62.0 (25; 62)
 PSD = 0



Effort = 0.9
 Total CPUE = 69.8 (28; 64)
 PSD = 0



Effort = 1.3
 Total CPUE = 101.3 (16; 135)
 PSD = 0

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, Abilene Reservoir, Texas, 1999, 2005, and 2007.

Blue Catfish

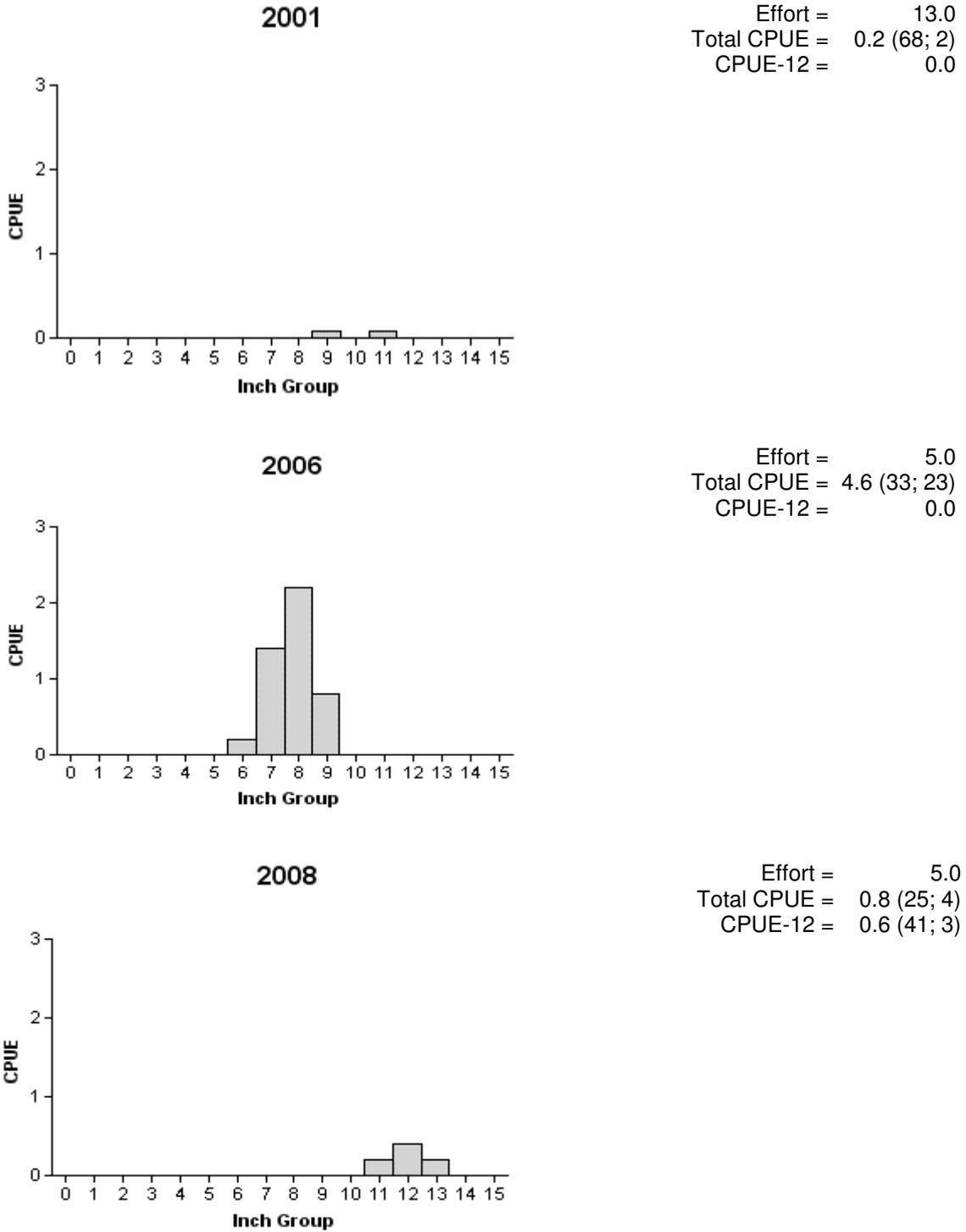
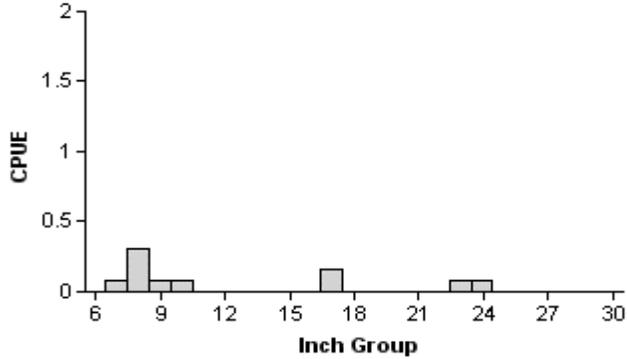


Figure 4. Number of blue catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Abilene Reservoir, Texas, 2001, 2006, and 2008.

Channel catfish

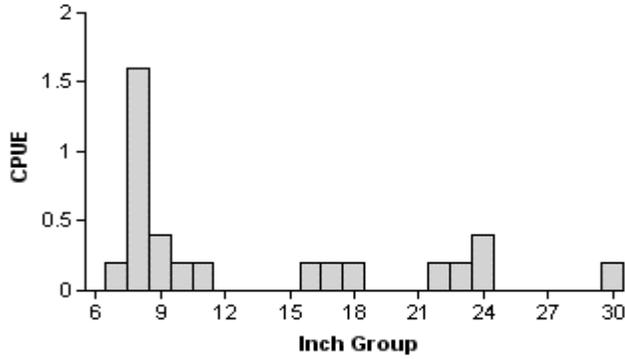
2001

Effort = 13.0
 Total CPUE = 0.8 (26; 11)
 CPUE-12 = 0.3 (57; 4)



2006

Effort = 5.0
 Total CPUE = 4.2 (12; 21)
 CPUE-12 = 1.6 (42; 8)



2008

Effort = 5.0
 Total CPUE = 1.8 (32; 9)
 CPUE-12 = 1.4 (17; 7)

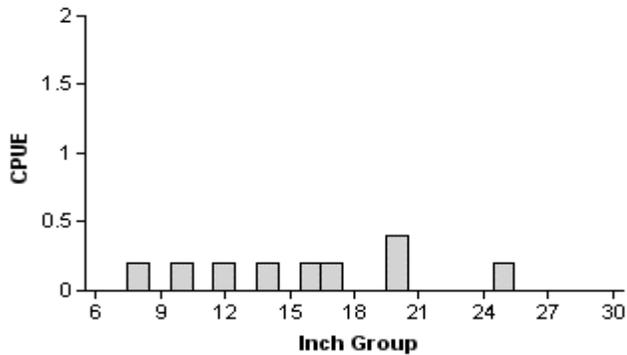


Figure 5. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Abilene Reservoir, Texas, 2001, 2006 and 2008.

Channel Catfish

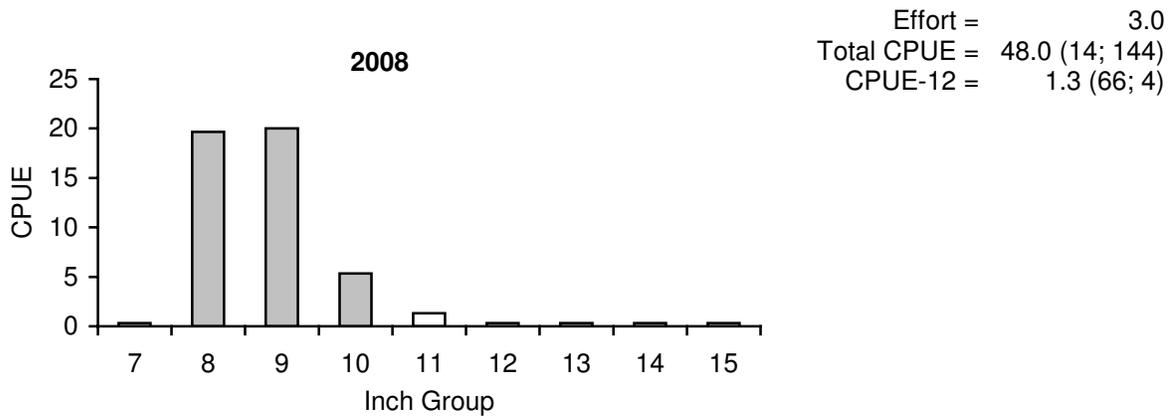
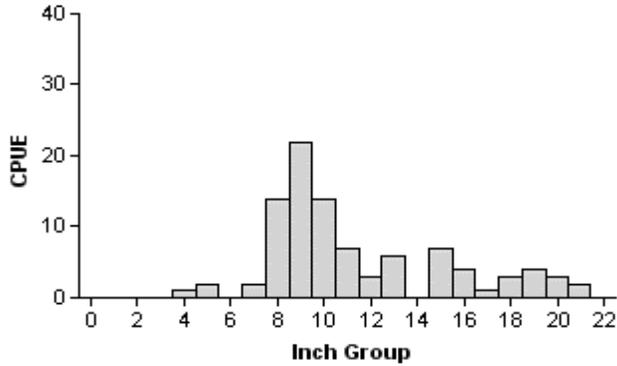


Figure 6. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring hoop net surveys, Abilene Reservoir, Texas, 2008.

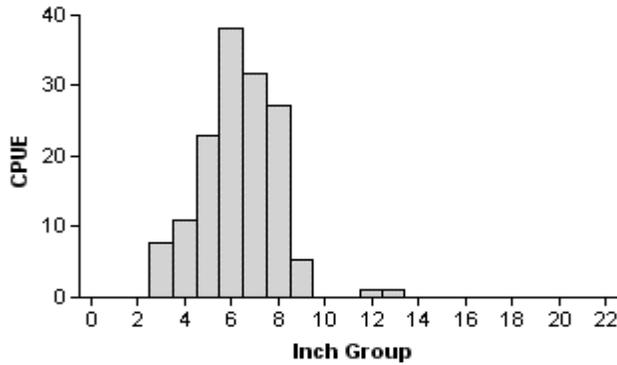
Largemouth Bass

1999



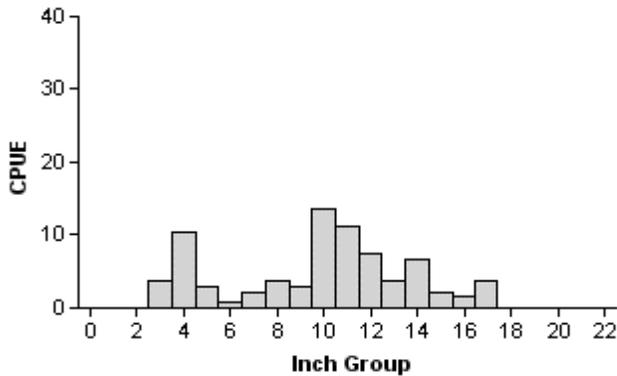
Effort =	1.0
Total CPUE =	95.0 (20; 95)
Stock CPUE =	90.0 (21; 90)
CPUE-14 =	24.0 (27; 24)
PSD =	37 (8)
PSD-14 =	27 (6)
PSD-P =	27 (6)

2005



Effort =	0.9
Total CPUE =	146.2 (14; 134)
Stock CPUE =	34.9 (29; 32)
CPUE-14 =	0.0
PSD =	6 (4)
PSD-14 =	0
PSD-P =	0

2007



Effort =	1.3
Total CPUE =	77.3 (16; 103)
Stock CPUE =	57.0 (18; 76)
CPUE-14 =	14.3 (19; 19)
PSD =	45 (6)
PSD-14 =	25 (6)
PSD-P =	13 (4)

Figure 7. Number of largemouth bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Abilene Reservoir, Texas, 1999, 2005, and 2007.

Largemouth Bass

Table 4. Average relative weight of 8.0-11.9-inch and 12.0-14.9-inch largemouth bass from 1999, 2005, and 2007 at Abilene Reservoir, Texas. Sample size for each estimate is in parentheses.

Year	Mean Wr		
	8.0-11.9	12.0-14.9	> 14.9
1999	82(57)	83(9)	98(24)
2005	109(30)	--	--
2007	95(42)	98(24)	104(10)

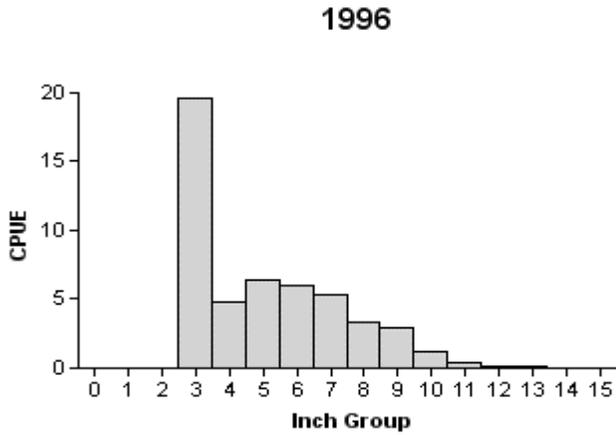
Table 5. Mean age at length of largemouth bass at 12 inches and 14 inches collected from fall electrofishing surveys in Abilene Reservoir, Texas, in 1996, 1999, and 2007. Sample size for each estimate is in parentheses.

Year	Mean age at length	
	12" (11.0"-12.9")	14" (13.0"-14.9")
1996	2.4 (9)	3.0 (3)
1999	3.6 (5)	3.4 (5)
2007	2.0 (22)	2.0 (12)

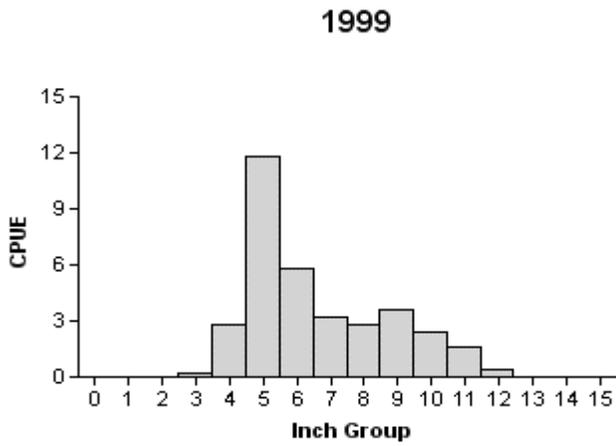
Table 6. Results of genetic analysis of largemouth bass collected by fall electrofishing, Abilene Reservoir, Texas, 1993, 1996, 1999, and 2007. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass. Microsatellite DNA analysis was used in 2007 and electrophoresis was used before 2007 to determine largemouth bass genetics.

Year	Sample size	Genotype			% FLMB alleles	% FLMB genotype
		FLMB	Intergrades	NLMB		
1993	14	0	1	13	3.6	0.0
1996	15	0	0	15	0.0	0.0
1999	25	1	15	9	29.0	4.0
2007	28	0	6	22	5.0	0.0

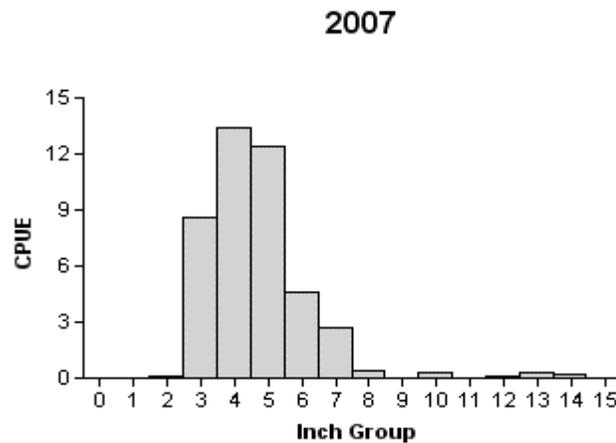
White Crappie



Effort = 5.0
 Total CPUE = 50.6 (27; 253)
 Stock CPUE = 26.2 (25; 131)
 CPUE-10 = 2.0 (88; 10)
 PSD = 32 (10)
 PSD-10 = 8 (5)



Effort = 5.0
 Total CPUE = 34.6 (17; 173)
 Stock CPUE = 31.6 (19; 158)
 CPUE-10 = 4.4 (44; 22)
 PSD = 34 (9)
 PSD-10 = 14 (5)



Effort = 10.0
 Total CPUE = 43.1 (32; 431)
 Stock CPUE = 21.0 (23; 210)
 CPUE-10 = 0.9 (35; 9)
 PSD = 6 (2)
 PSD-10 = 4 (2)

Figure 8. Number of white crappie caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Abilene Reservoir, Texas, 1996, 1999 and 2007.

Table 7. Proposed sampling schedule for Abilene Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

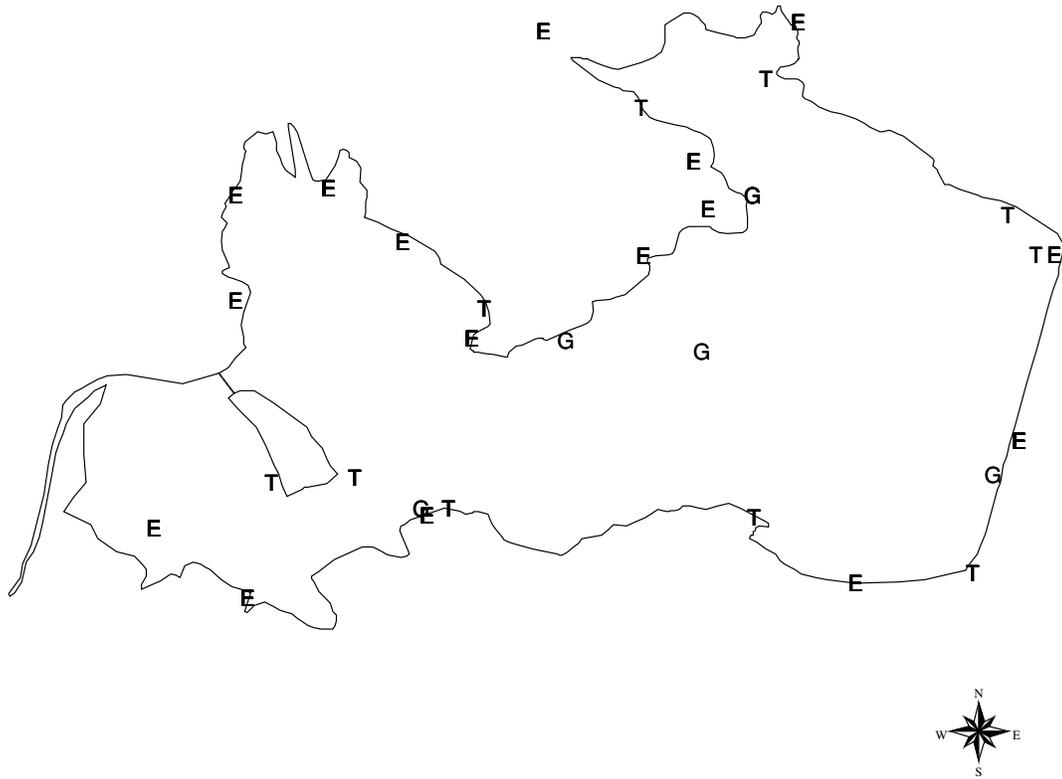
Survey Year	Electrofisher	Trap Net	Gill Net	Hoop Net	Report
Fall 2008-Spring 2009					
Fall 2009-Spring 2010	A	A			
Fall 2010-Spring 2011					
Fall 2011-Spring 2012	S	S	S	A	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from Abilene Reservoir, Texas, 2007-2008.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					674	505.5
Blue catfish	4	0.8				
Channel catfish	9	1.8				
Green sunfish					2	1.5
Warmouth					2	1.5
Bluegill					135	101.3
Longear sunfish					10	7.5
Redear sunfish					1	.7
Largemouth bass					103	77.3
White crappie			431	43.1		

APPENDIX B



Location of sampling sites, Abilene Reservoir, Texas, 2007-2008. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was at conservation level at time of sampling.