

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

**Davy Crockett**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Davy Crockett Reservoir were surveyed in 2005 using an electrofisher and trap nets and in 2006 using gill nets. Habitat was surveyed in 2005. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Davy Crockett Reservoir is a 355-acre impoundment located on Dixon and Sandy Creeks approximately 14 miles northeast of Bonham. Water level has remained within 3 feet of the spillway since 2001. Davy Crockett Reservoir has moderate, and increasing, productivity. Habitat features consisted mainly of native emerged vegetation and native submerged vegetation, especially along the shoreline and in the two main bays in the upper end.
- **Management history:** Important sport fish included channel catfish, largemouth bass, and crappies. The management plan from the 2001 survey report included a recommendation to discontinue stocking Florida largemouth bass, which were stocked in 1997-1999. After 3 consecutive years of stocking, introduction of Florida alleles into the native largemouth bass population was unsuccessful. A 14- to 18-inch slot length limit for largemouth bass was implemented in 1996. A spring and fall creel survey in 2001 revealed most anglers sought to catch largemouth bass, followed by channel catfish, and crappie. Anglers did not harvest under-the-slot largemouth bass, as expected. Overall angling pressure during the spring and fall of 2001 was low. Habitat surveys have revealed an increase in emerged and submerged vegetation in this reservoir.
- **Fish community**
  - **Prey species:** Electrofishing catch of gizzard shad was high, and over half the gizzard shad were available as prey. Electrofishing catch of bluegills was high, and they provided excellent prey.
  - **Channel catfish:** Gill net catch of channel catfish was low, but the entire sample population was legal-size and in excellent condition. There was little evidence of recruitment of young channel catfish. Growth was good.
  - **Largemouth bass:** Electrofishing catch of largemouth bass was lower; but because of the slot length limit, there were good numbers of fish 14 inches and larger. Largemouth bass had adequate growth rates and were in good condition.
  - **Crappies:** Abundance was good, growth was adequate, and body condition of fish  $\geq 11$  inches continued to be good for white crappie. Black crappie are routinely sampled in this reservoir, but in low numbers. A few were collected in this survey.
- **Management strategies:** Stock advanced channel catfish at 12.5/acre in 2006 (if available), 2007, and 2008. Evaluate with routine gill net survey in 2010. Stock adult threadfin shad at 1/acre each spring from 2007 to 2009. Encourage U.S. Forest Service to install and maintain lighting at the boat ramp and pier. Conduct supplemental electrofishing for largemouth bass in fall of 2006. Conduct general monitoring with electrofisher, trap nets, and gill nets in 2009-2010. Conduct a habitat survey in 2009.

## INTRODUCTION

This document is a summary of fisheries data collected from Davy Crockett 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*

Davy Crockett Reservoir is a 355-acre impoundment constructed in 1938 on Dixon and Sandy Creeks. It is located in Fannin County approximately 14 miles northeast of Bonham and is operated and controlled by the U.S. Forest Service. Primary water uses included wildlife management and recreation. Chl-a measurements were not available for Davy Crockett Reservoir, however average Secchi disk transparency was 110 cm for 2005-2006 and suggests mesotrophic conditions as per Carlson's Trophic State Index (Texas Commission on Environmental Quality 2002). Mesotrophic conditions are further supported by a heavily vegetated watershed that deposits organic debris on the ground resulting in allochthonous enrichment (Findenegg 1966; Sorokin 1966). Habitat at time of sampling consisted of native emerged vegetation and native submerged vegetation. Native plants present were southern naiad, common cattail, bulrush, American lotus, and coontail. Water level was not monitored in this reservoir, but anecdotal data from casual observations by our staff and U.S. Forest Service personnel concluded the reservoir has been within 3 feet of the spillway since 2001. Boat access consisted of one public boat ramp. Bank fishing access in one campground was augmented by a pier. The boat ramp and pier were not lighted, which would provide more convenience for the angler. Bank angling is accessible at a second campground and other shoreline areas on the reservoir's perimeter. Other descriptive characteristics for Davy Crockett Reservoir are in Table 1.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Hysmith and Moczygemba 2002) included:

1. Discontinue the stocking of Florida largemouth bass fingerlings.  
**Action:** Removed Davy Crockett Reservoir from the Florida largemouth bass stocking list.
2. Update the Davy Crockett Reservoir web page as required.  
**Action:** Recommendations were made as appropriate.  
(Added after Hysmith and Moczygemba 2002 was submitted to Austin)
3. Conduct a supplemental electrofishing survey in 2003 for largemouth bass to verify low catch rate obtained in 2001.  
**Action:** CPUE was 108.0/h, lower than the 165.0/h collected in 2001 and continued the declining population trend begun in 1997.

**Harvest regulation history:** Sportfishes in Davy Crockett Reservoir are currently managed with statewide regulations with the exception of largemouth bass (Table 2). From 1986 to 1996, largemouth bass were managed with a 14-inch minimum length limit. A 14- to 18-inch slot length limit was implemented in 1996 to improve the population size structure.

**Stocking history:** Davy Crockett Reservoir has not been stocked since 1999 (channel catfish and Florida largemouth bass). Prior to 1999 channel catfish were stocked infrequently starting in 1968. In 1994, 1995, and 1999 advanced fingerling channel catfish were stocked. Florida largemouth bass were stocked annually from 1997 to 1999. The complete stocking history since 1968 is in Table 3. The reservoir was partially drained and treated with rotenone in 1963 to control gizzard shad which may have impacted other species as well (Bonn 1963).

**Vegetation/habitat history:** Davy Crockett Reservoir supported submerged and emerged aquatic vegetation (Table 4). Submerged aquatic vegetation (southern naiad and coontail) was common, but not considered problematic. Emerged aquatic vegetation (common cattail and bulrush) was also common and not problematic, except American lotus prevents access to portions of both major bays in the upper part of the reservoir. Increasing American lotus has also blocked the waterway between the end of a main lake point between the two major bays and a small island to the north. Native submerged vegetation and native emerged vegetation together currently cover approximately 30% of the reservoir. Most of this infestation occurs from the shoreline out to 8 feet deep water.

## METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (5 net nights at 5 stations). 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 and trap nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [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 =  $100 \times \text{SE of the estimate/estimate}$ ) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Ages for largemouth bass and white crappie were determined using Category 2 protocol and otoliths from 13 to 33 fish according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004). The manual specifies for largemouth bass only, but we adapted the protocol to include crappie to identify the number of fish in the sample. Target size (11 – 12 inches) channel catfish were not collected; therefore, otoliths were removed from 3 large fish. Source for water level data was TPWD and U.S. Forest Service observations.

## RESULTS AND DISCUSSION

**Habitat:** Littoral zone habitat consisted primarily of emerged native vegetation and native submerged vegetation (Table 4).

**Prey species:** Electrofishing CPUE of gizzard shad and bluegill were 156.0/h and 651.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was good, indicating 69% of gizzard shad were available to existing predators; this was higher than IOV estimates in previous years (Figure 1). Total CPUE of gizzard shad was considerably higher in 2005 compared to the 2001 survey (Figure 1). Total CPUE of bluegill in 2005 was lower than total CPUE from surveys in 2001 and 1997, and size structure continued to be dominated by small individuals (Figure 2). Threadfin shad have never been collected from Davy Crockett Reservoir and would diversify the prey availability for the reservoir, if present.

**Channel catfish:** The gill net CPUE of channel catfish was 3.8/nn in 2006 (Figure 3). The channel catfish population continued to decline in abundance with an apparent absence of sub-stock fish in 2006 and 2002 compared to the 1997 survey. The fish were healthy as evidenced by relative weights above 100. Growth of channel catfish to legal size (12 inches) in Davy Crockett Reservoir was undetermined because target size (11 – 12 inches) fish were not available; therefore, otoliths were taken from 3 26-inch fish. Growth was excellent (Carlander 1969); average age at 26 inches (25.8 – 26.8 inches) was 7 years (N = 3; all were 7 years old).

**Largemouth bass:** The electrofishing CPUE of stock-length largemouth bass was 62.0/h in 2005, lower than the 95.0/h in 2003. Size structure was adequate considering there were sub-stock fish, fish within the slot, and fish above the slot (Figure 4). However, since 1997 sub-stock largemouth bass numbers have been declining while numbers within the slot and above the slot have remained fairly constant. Reasons for the decline could be harvest of sub-stock fish, low reproduction, or sampling efficiency. A creel survey in spring and fall of 2001 showed no harvest of sub-stock fish. Low reproduction is hard to

verify unless sampling efficiency is validated or improved. Growth of largemouth bass in Davy Crockett Reservoir was good. Average age at 14 inches (13.7 to 14.6 inches) was 2.5 years (N = 19; range = 2 – 3 years). Body condition in 2005 was good (relative weight between 90 and 100) for nearly all size classes of fish and was similar to body condition in previous surveys (Figure 4). Florida largemouth bass influence was inadequate, but has persisted at a low level despite discontinuing Florida largemouth bass stocking after 1999 (Table 5).

**Crappies:** The trap net CPUE of white crappie was 25.8/nn in 2005, higher than in 2001 (13.0/nn) and similar to 1997 (23.0/nn). The PSD was 30 and was much lower than previous years (Figure 5). The difference was attributed to abundance of 6-inch white crappie in 2005. Mean relative weight was 90 – 100 for sizes  $\geq$  11 inches in 2005, but was less for crappie 6 – 10 inches. This was similar to body condition for white crappie in previous years (Figure 5). Growth of white crappie in Davy Crockett Reservoir was slow. Average age at 10 inches (9.90 to 9.96 inches) was 3 years (N = 14; range = 2 – 4).

Black crappie were found in low numbers in surveys from 1997 to 2005 (Figure 6). Even though the PSD has dropped each survey, the PSD was still 50 or better. The mean relative weights have been consistently between 80 and 90.

## Fisheries management plan for Davy Crockett Reservoir, Texas

Prepared – July 2006.

**ISSUE 1:** The channel catfish fishery cannot maintain itself without stocking advanced channel catfish fingerlings. Stocked fish survive, grow, and contribute to the fishery. As evidenced by channel catfish moving through the system from 1997 through 2005, there is very little recruitment to legal size without supplemental stocking.

### MANAGEMENT STRATEGIES

1. Stock advanced fingerling channel catfish (12.5/acre) annually for 2 years beginning in 2007 or 2006 if available.
2. Assess the channel catfish population in the spring of 2010 with general survey gill netting.

**ISSUE 2:** There is an apparent decline of sub-stock largemouth bass. Electrofishing catch rate of sub-stock largemouth bass has been declining since 1997.

### MANAGEMENT STRATEGY

1. Conduct supplemental electrofishing survey for largemouth bass in fall 2006.

**ISSUE 3:** Threadfin shad are not present in the reservoir. Prey diversity would increase the availability of forage for the predator species.

### MANAGEMENT STRATEGY

1. Stock adult threadfin shad (1/acre) annually each spring from 2007 to 2009. Discontinue if they become established.

**ISSUE 4:** Boat ramp and boarding/fishing pier are unlighted.

### MANAGEMENT STRATEGY

1. Encourage U.S. Forest Service to install and maintain lighting between existing boat ramp and boarding/fishing pier at the east campground.

### **SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes electrofishing 2006 and mandatory monitoring in 2009/2010 (Table 6). Additional electrofishing in 2006 is necessary to validate the low catch rates of sub-stock largemouth bass in past surveys.

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Table 1. Characteristics of Davy Crockett Reservoir, Texas.

Characteristic	Description
Year constructed	1938
Controlling authority	U.S. Forest Service
County	Fannin
Reservoir type	Offstream
Shoreline development index	2.1
Conductivity	164 umhos/cm

Table 2. Harvest regulations for Davy Crockett Reservoir.

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

Table 3. Stocking history of Davy Crockett Reservoir, Texas. Size categories are: FRY =&lt;1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Species	Year	Number	Size
Channel catfish	1968	48,680	FGL
	1978	10,859	FGL
	1991	7,500	FGL
	1992	6,106	FGL
	1994	1,100	AFGL
	1995	1,200	AFGL
	1999	8,776	AFGL
	Total	84,221	
Green x Redear sunfish	1976	260	FGL
	1978	17,785	FGL
	Total	18,045	
Largemouth bass	1976	260	FGL
Florida largemouth bass	1997	35,000	FGL
	1998	35,004	FGL
	1999	35,281	FGL
Total		105,285	

Table 4. Survey of littoral zone and physical habitat types, Davy Crockett Reservoir, Texas, 2005. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Concrete	0.2	3.6		
Eroded bank	<0.1	1.8		
Rip rap	0.2	3.6		
Native submerged vegetation	2.0	36.4	52.7	15.1
Native emerged vegetation	3.0	54.5	55.6	15.9

## Gizzard Shad

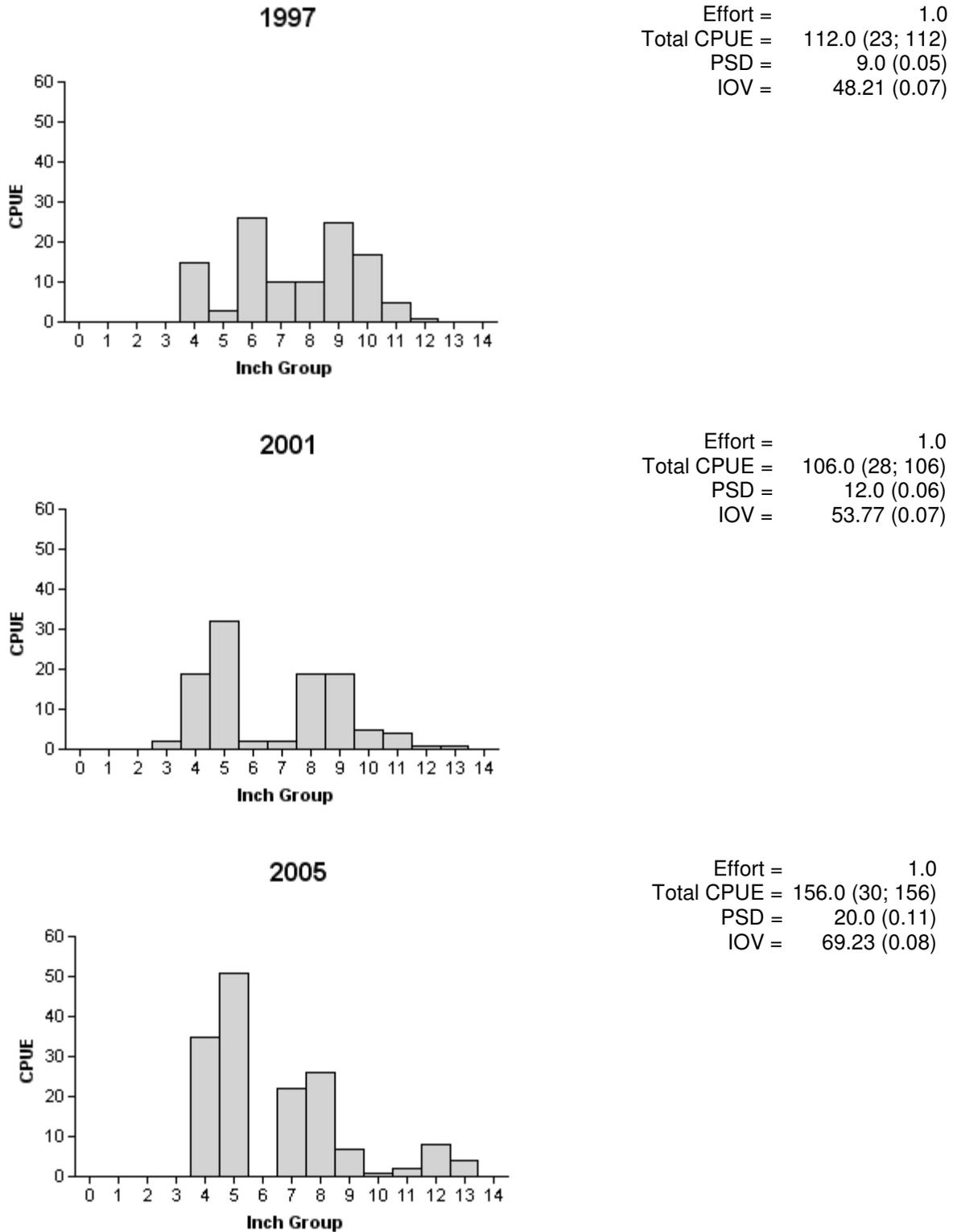
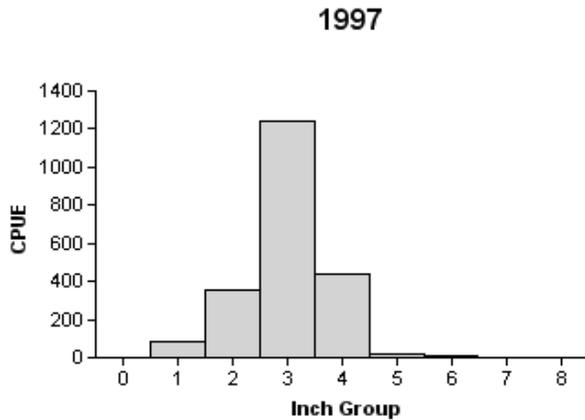
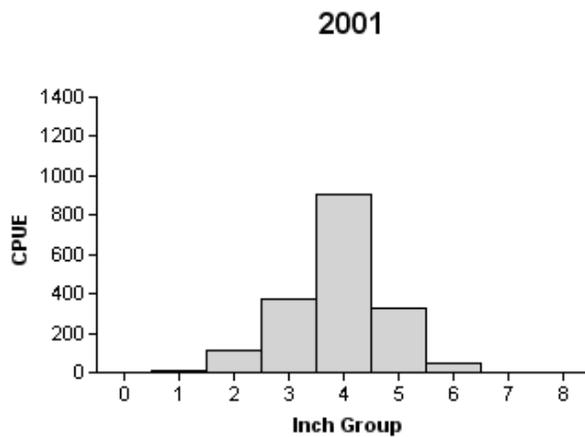


Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Davy Crockett Reservoir, Texas 1997, 2001, and 2005.

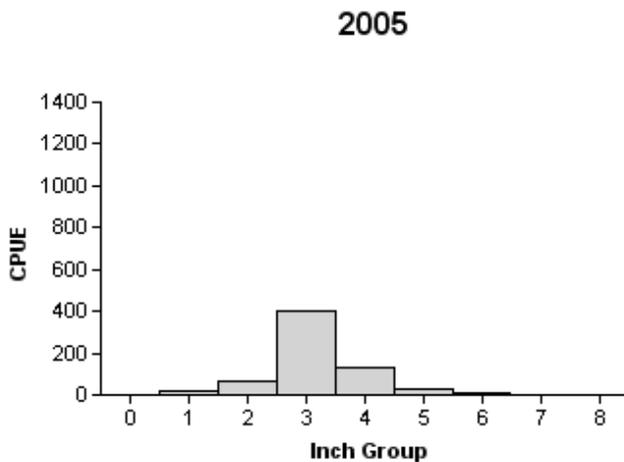
## Bluegill



Effort = 1.0  
 Total CPUE = 2,141.0 (14; 2,141)  
 PSD = 0.0 (0)



Effort = 1.0  
 Total CPUE = 1,783.0 (12; 1,783)  
 PSD = 3.0 (0.00)



Effort = 1.0  
 Total CPUE = 651.0 (20; 651)  
 PSD = 1.0 (0.01)

Figure 2. 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, Davy Crockett Reservoir, Texas, 1997, 2001, and 2005.

## Channel Catfish

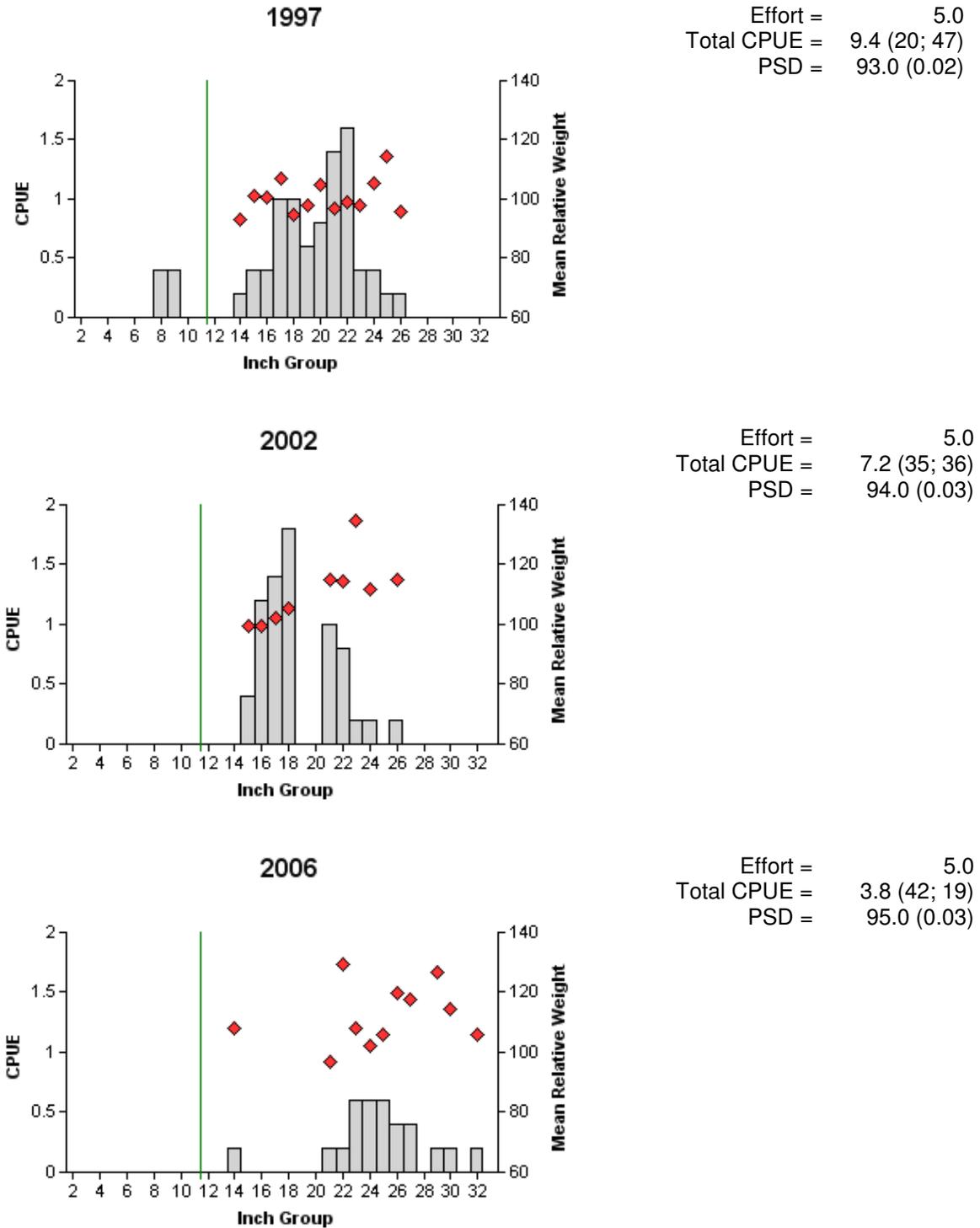


Figure 3. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Davy Crockett Reservoir, Texas, 1997, 2002, and 2006. Vertical lines represent length limit at time of collection.

## Largemouth Bass

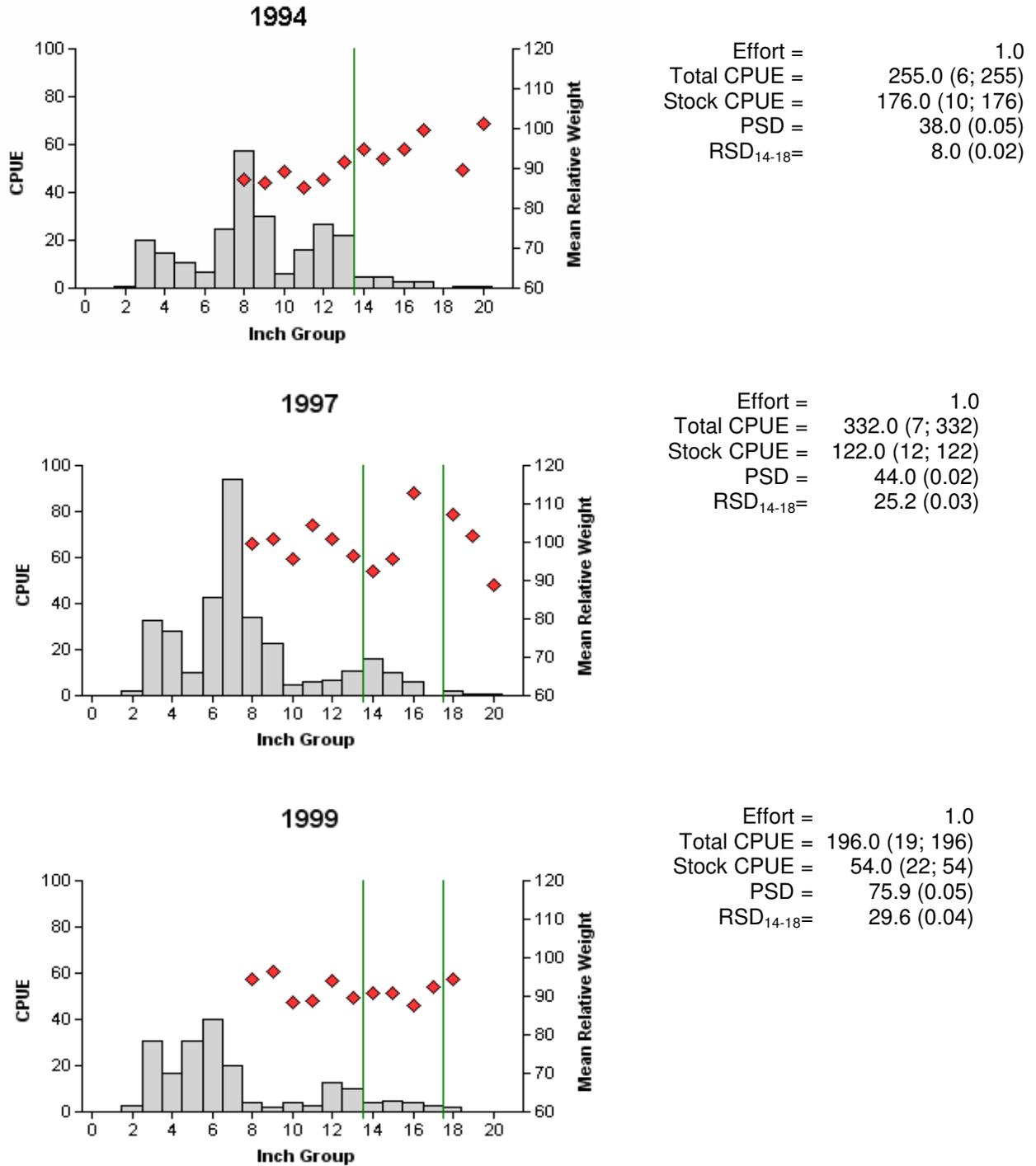


Figure 4. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Davy Crockett Reservoir, Texas, 1994, 1997, 1999. Vertical lines represent length limit at time of collection.

## Largemouth Bass

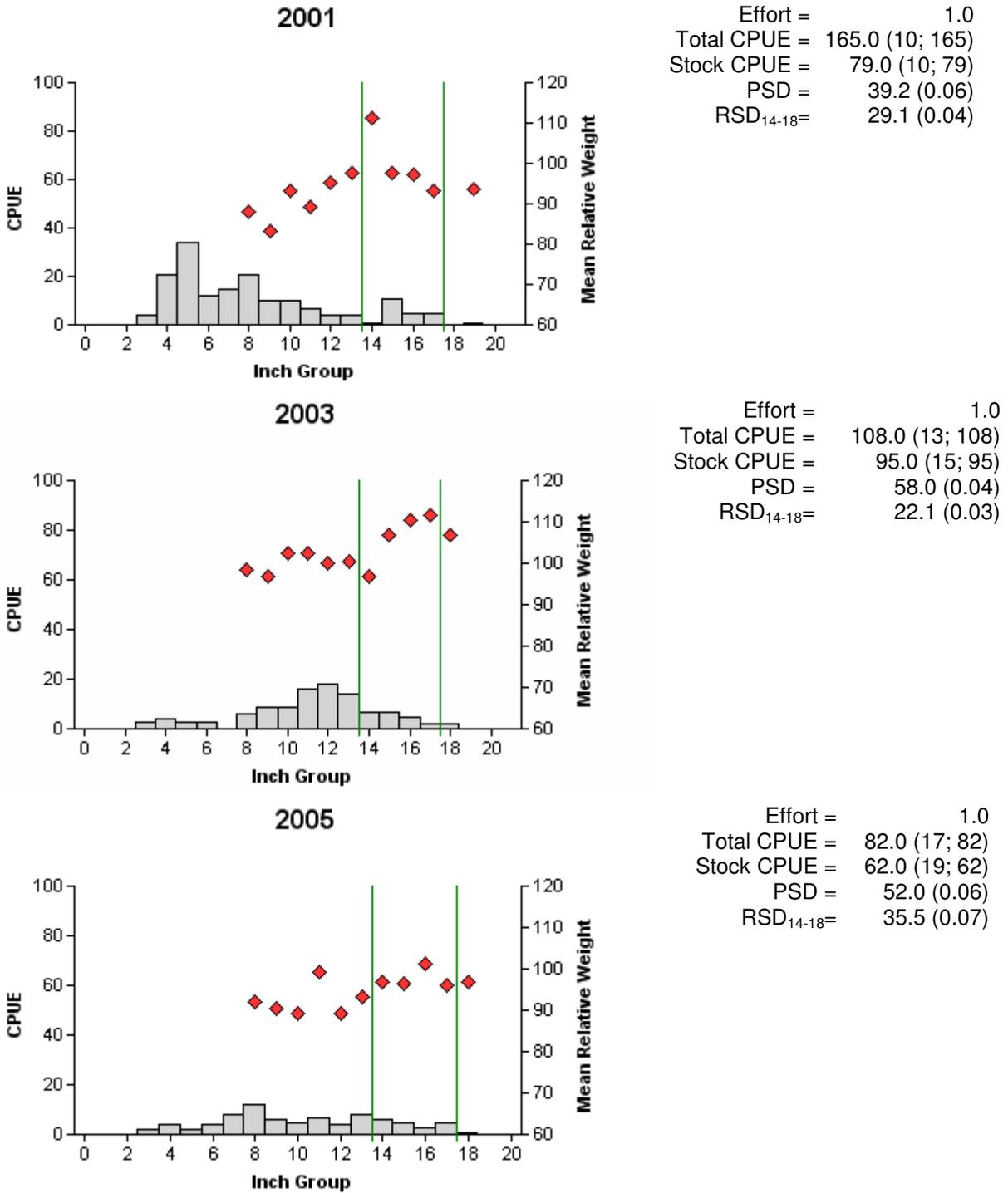
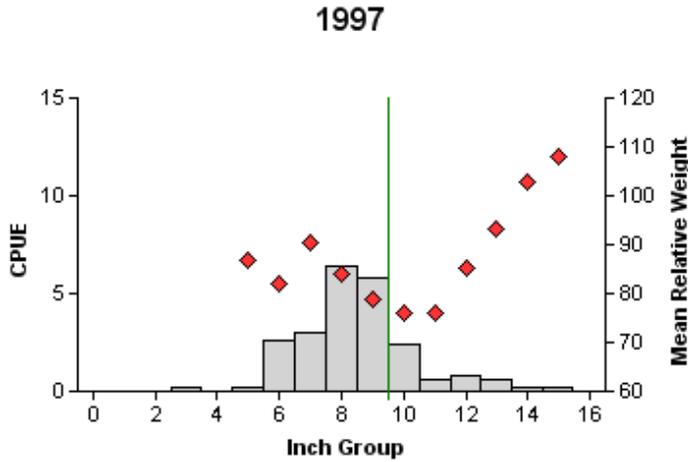


Figure 4 continued. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Davy Crockett Reservoir, Texas, 2001, 2003, and 2005. Vertical lines represent slot length limit at time of collection.

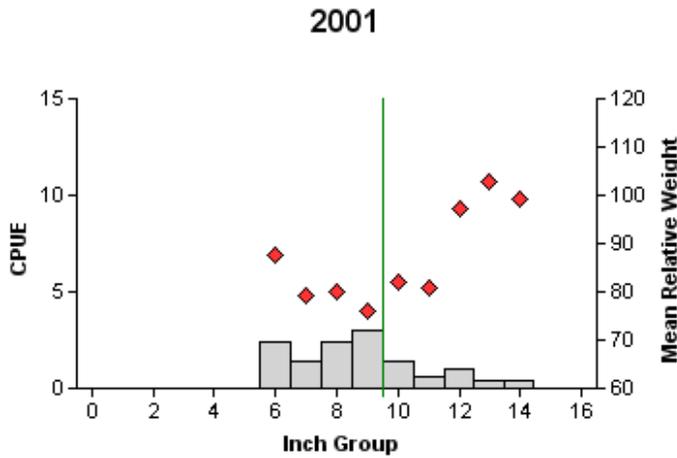
Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Davy Crockett Reservoir, Texas, 1999, 2001, and 2005. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype			NLMB	% FLMB alleles	% pure FLMB
		FLMB	F1	Fx			
1999	40	2	0	3	35	7.5	5.0
2001	30	0	4	7	19	12.5	0.0
2005	30	0	0	8	22	8.7	0.0

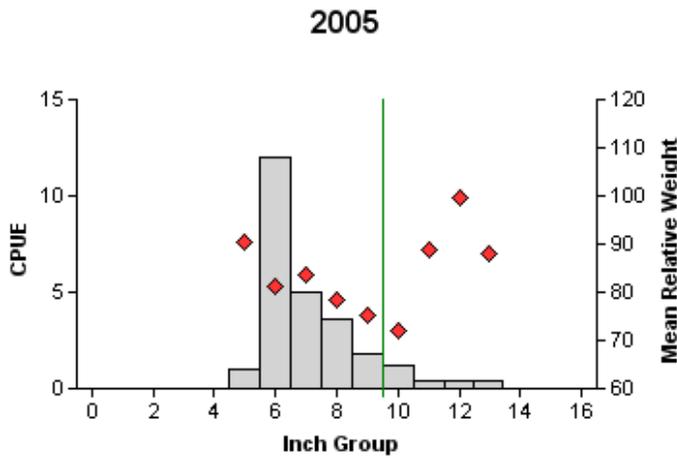
## White Crappie



Effort = 5.0  
 Total CPUE = 23.0 (39; 115)  
 PSD = 75.0 (0.08)



Effort = 5.0  
 Total CPUE = 13.0 (28; 65)  
 PSD = 71.0 (0.08)



Effort = 5.0  
 Total CPUE = 25.8 (57; 129)  
 PSD = 30.0 (0.07)

Figure 5. Number of white crappie 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 fall trap netting surveys, Davy Crockett Reservoir, Texas, 1997, 2001, and 2005. Vertical lines represent length limit at time of collection.

## Black Crappie

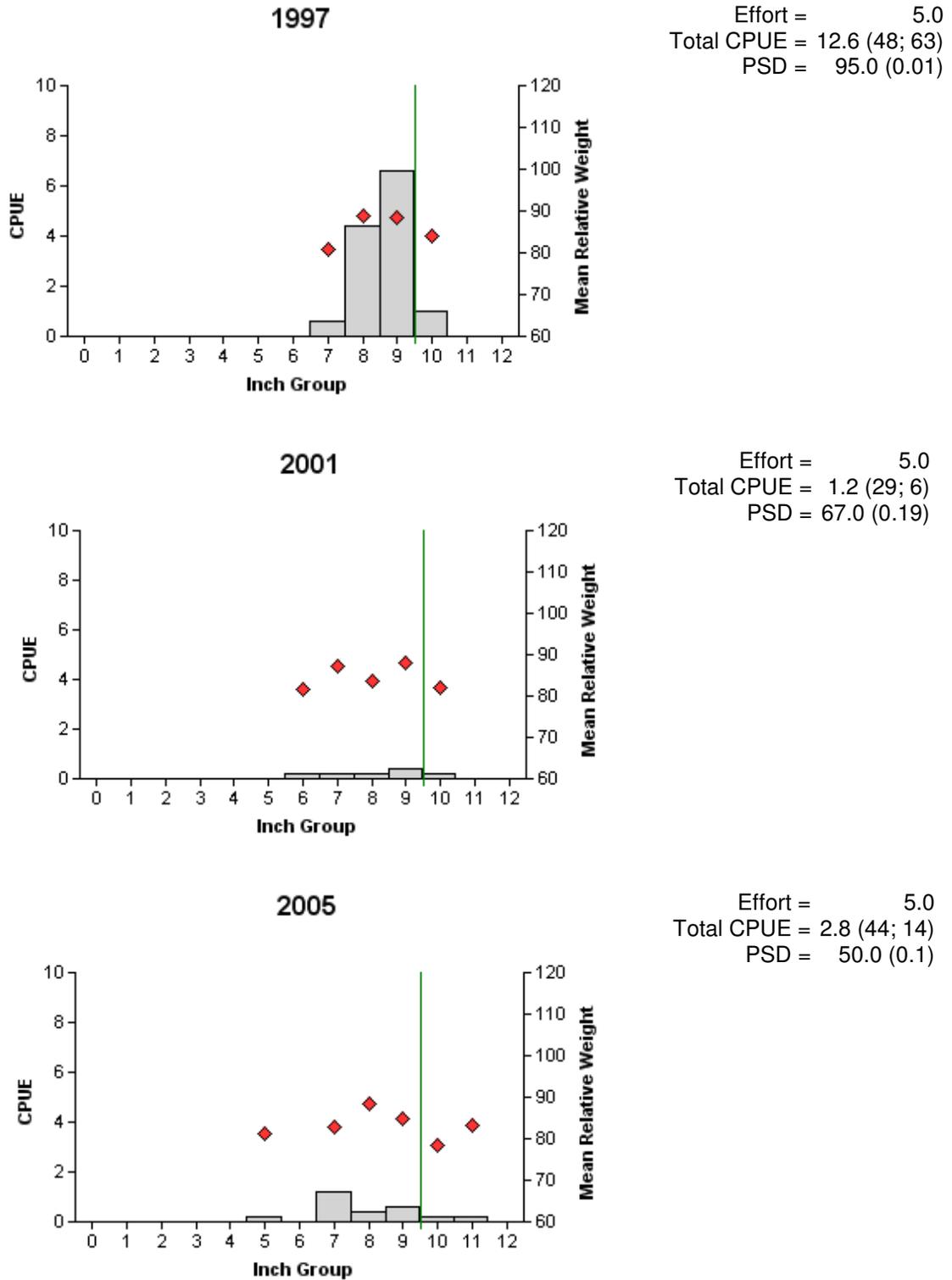


Figure 6. Number of black crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure) for fall trap netting surveys, Davy Crockett Reservoir, Texas, 1997, 2001, and 2005. Vertical lines represent length limit at time of collection.

Table 6. Proposed sampling schedule for Davy Crockett Reservoir, Texas. Electrofishing and trap netting surveys are conducted in the fall, while gill netting surveys are conducted during the following spring. Standard survey denoted by S and additional survey denoted by A.

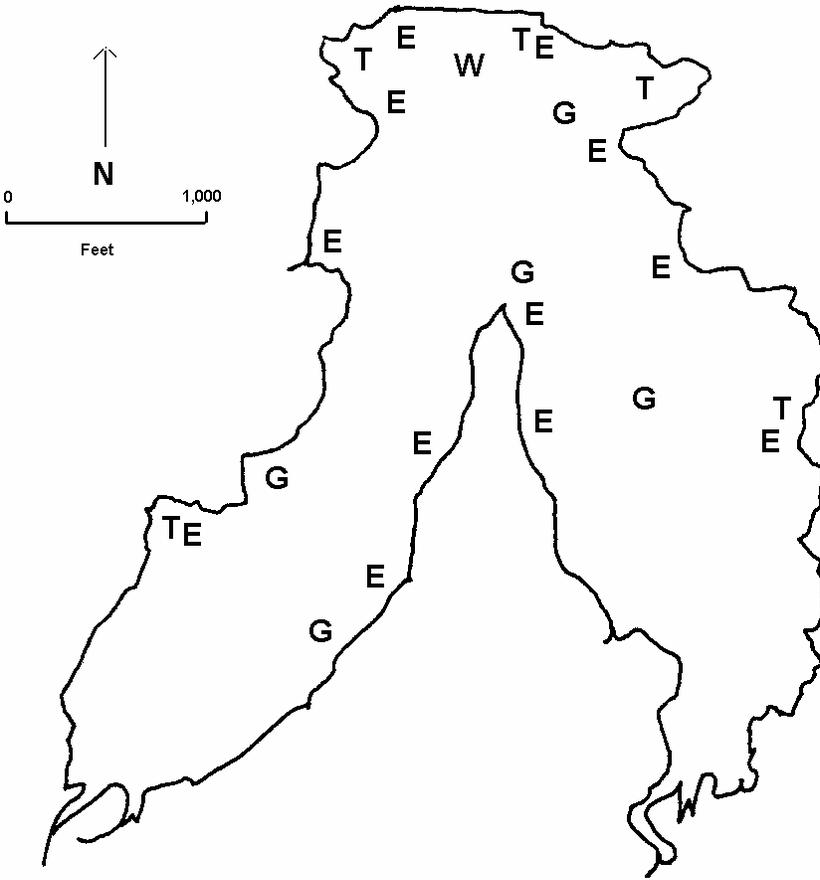
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2006-Spring 2007	A				
Fall 2007-Spring 2008					
Fall 2008-Spring 2009					
Fall 2009-Spring 2010	S	S	S		S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Davy Crockett Reservoir, Texas, 2005-2006.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					156	156.0
Channel catfish	19	3.8				
Green sunfish					9	9.0
Warmouth					5	5.0
Bluegill					651	651.0
Redear sunfish					31	31.0
Largemouth bass					82	82.0
White crappie			129	25.8		
Black crappie			14	2.8		

## APPENDIX B



Location of sampling sites, Davy Crockett Reservoir, Texas, 2005-2006. Trap netting, gill netting, electrofishing, and water sampling stations are indicated by T, G, E, and W, respectively. Water level was 3 feet below conservation for trap netting and electrofishing and one foot below during gill netting.

**APPENDIX C**

Water sample parameters for Davy Crockett Reservoir, Texas, July 8, 2005. Sample station located at dam site.

Depth (m)	Temp (C°)	D.O. (ppm)	Chlorides (ppm)	Conductivity (mhos/cm)	Alkalinity (ppm)	Total dissolved solids (ppm)	pH
Surface	30.5	7.4	5	176.0	68	114.4	7.5
1.0	29.8	8.4					
2.0	29.3	7.7					
3.0	29.1	6.0	8	190.4	63	123.8	7.3
4.0	28.7	1.4					
5.0	28.1	0.0					
6.0	25.5	0.0	3	217.0	80	141.0	6.8

## APPENDIX D

Historical catch rates of targeted species by gear type for Davy Crockett Reservoir, Texas, 1988, 1994, 1997, 1999<sub>a</sub>, 2001, 2002, 2003, 2005, and 2006.

Gear	Species	Year								
		1988	1994	1997	1999 <sub>a</sub>	2001	2002	2003 <sub>a</sub>	2005	2006
Gill netting	Channel catfish		16.8	9.4			7.2			3.8
Electrofishing	Gizzard shad	37.0	68.0	112.0		106.0			156.0	
	Green sunfish	10.0	3.0	1.0		5.0			9.0	
	Warmouth	115.0	76.0	176.0		70.0			5.0	
	Bluegill	232.0	502.0	2141.0		1783.0			651.0	
	Redear sunfish	33.0	31.0	128.0		109.0			31.0	
Trap netting	Largemouth bass	223.0	255.0	332.0	196.0	165.0		108.0	82.0	
	White crappie		25.6	23.0		13.0			25.8	
	Black crappie		5.2	12.6		1.2			2.8	

<sup>a</sup> Largemouth bass sampled only.