

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-34

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

Mackenzie Reservoir

Prepared by:

John Clayton and Charles Munger
Inland Fisheries Division
District 1-A, Canyon, Texas



Carter Smith
Executive Director

Phil Durocher
Director, Inland Fisheries

July 31, 2009

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Mackenzie Reservoir were surveyed with electrofishing and trap nets in 2008 and gill nets in 2009. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Mackenzie Reservoir was constructed in 1974 on Tule Creek, a tributary of the Prairie Dog Town Fork of the Red River. It is located 12 miles northwest of Silverton in Briscoe County, Texas. The reservoir is owned by the Mackenzie Municipal Water Authority and is used for water supply and recreational purposes. Mackenzie Reservoir is characterized as being a deep, clear, mesotrophic reservoir that experiences strong thermal stratification during summer months. At conservation pool (3,100 feet above mean sea level; FMSL) Mackenzie Reservoir is a 900-acre impoundment. At the time of sampling, the reservoir had a mean elevation of 3020 FMSL and a surface area of approximately 254 acres. Since impoundment, the reservoir has never caught sufficient runoff to fill to capacity. Angler and boat access is adequate, but there are no disabled specific facilities. Habitat consisted primarily of boulder, rock bluff, and flooded terrestrial vegetation.
- **Management history:** Sport fish include largemouth bass, palmetto bass, white bass, white crappie, and catfish. All species have been managed with statewide harvest regulations.
- **Fish Community**
 - **Prey species:** Gizzard shad and bluegill were present in the reservoir. Electrofishing catch of gizzard shad was 234.0/h; however, only 16% were considered to be available as prey to sport fish. Electrofishing catch of bluegills was 96.0/h, and most bluegills were less than 4-inches long making them available as prey.
 - **Catfishes:** The blue catfish gill net catch rate showed an increase from previous years while the channel catfish gill net catch rate declined slightly. Flathead catfish are present in the reservoir; however, only one flathead was sampled during the electrofishing survey.
 - **White bass:** White bass gill net catch rate was 4.4/nn which was slightly higher than in previous years. Past creel surveys indicated that white bass in the reservoir received little angling effort.
 - **Palmetto bass:** Gill net catch rates for palmetto bass have improved over the past four years. Catch rates have improved from 0.4/nn in 2005 to 6.8/nn in 2009, and 82% of the fish sampled were 18 inches or larger.
 - **Largemouth bass:** Largemouth bass were abundant with a catch rate of 143/h; however, the majority of fish sampled were less than 8 inches. 17% of the fish sampled were of legal size for harvest (≥ 14 in).
 - **Crappie:** White crappie were present in the reservoir. Trap net catch rates declined from 9.2/nn in 2000 to 2.0/nn in 2008. Survey results showed that 22% of the fish sampled were 10 inches or greater in length.
 - **Management Strategies:** Continue management under current harvest regulations. The proposed sampling schedule is a continuation of the current schedule with the addition of electrofishing in 2009 and 2010 and gill netting in 2011.

INTRODUCTION

This document is a summary of fisheries data collected from Mackenzie Reservoir in 2008-2009. 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 2008-2009 data for comparison.

Reservoir Description

Mackenzie Reservoir is a 900-acre impoundment on the Tule Creek, a tributary of the Prairie Dog Town Fork of the Red River. It is located 12 miles northwest of Silverton in Briscoe County, Texas. The reservoir is owned by the Mackenzie Municipal Water Authority and is used for water supply and recreational purposes. The reservoir has a history of water level fluctuations (Figure 1). The reservoir surface area was approximately 313 acres from 2005 to late 2007 then declined to approximately 250 acres in 2008. Water levels have remained fairly stable since 2008 (Figure 1). Mackenzie Reservoir is characterized as a deep, clear, mesotrophic reservoir with a mean Trophic State Index chl-*a* of 51.6, which was slightly lower than previous samples (Texas Commission on Environmental Quality 2008). It also experiences thermal stratification during summer months. At the time of sampling, the habitat consisted primarily of gravel/rocky shoreline, rock bluff, and flooded terrestrial vegetation. Angler and boat access consists of two boat ramps and large shoreline access areas; however there are no disabled specific facilities. At current lake levels only one boat ramp is useable. Other descriptive characteristics for Mackenzie Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Henegar 2005) included:

- Although the catch rate for the 2005 gill net survey was low, a quality palmetto bass population had existed in Mackenzie Reservoir. Low catch rates were likely a result of record low water levels during 2004 and/or a missed stocking in 2001 due to a fish kill at the hatchery.

Action: Palmetto bass were successfully stocked in 2003, 2005, and 2007. An additional gill net survey was conducted in the spring of 2006.

Harvest regulation history: Sport fishes in Mackenzie Reservoir have been and currently are managed with statewide regulations (Table 2).

Stocking history: Mackenzie Reservoir was last stocked in 2007 (palmetto bass). The complete stocking history is in Table 3.

Vegetation/habitat history: No significant man-made changes have occurred at the reservoir since 2000 (Van Zee 2001). Historically, vegetation in Mackenzie reservoir has consisted of flooded timber.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (20 net nights at 10 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 per net night (fish/nn). All electrofishing, gill netting and trap netting survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Habitat survey was conducted on August 26, 2008.

2008 trap net survey was part of a statewide lighted trap net study. Ten trap net sights (5 lighted, 5 unlighted, randomly assigned) were set at randomly selected locations throughout the reservoir and fished overnight following standard TPWD crappie sampling protocols (TPWD Fishery Assessment Procedures Manual). The same trap net sights were then reassigned (5 lighted switched to 5 unlighted and 5 unlighted switched to 5 lighted) and fished for a second night.

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 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Source for water level data was the United States Geological Survey (USGS) website.

RESULTS AND DISCUSSION

Habitat: A habitat survey was conducted on August 26, 2008. Primary habitat consisted of rocky or gravel shoreline (56.7%), featureless shoreline (24.8%), and featureless shoreline with flooded standing timber (14.3%) (Table 4).

Prey species: Electrofishing catch rates of gizzard shad and bluegill were 234.0/h and 96.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was poor, indicating only 16% of gizzard shad were available to existing predators; this was considerably lower than the IOV estimates from 2004 (IOV=89) and 2006 (IOV=35) (Figure 2). Total CPUE of gizzard shad was lower in 2008 compared to the 2006 survey, but it was similar to the 2004 survey (Figure 2). Total CPUE of bluegill in 2008 was similar to 2006, and nearly double that of 2004. Size structure of bluegill appears to be dominated by small individuals (Figure 3).

Catfishes: The gill net catch rate for blue catfish in 2009 was 1.4/nn; this is an increase over the previous catch rates of 0.2/nn in 2007 and 0.8/nn in 2006. The blue catfish had W_r 's near or above 90 (Figure 4). The gill net catch rate of channel catfish was 2.4/nn in 2009. The channel catfish population continued to have low relative abundance (Figure 5). Larger inch classes of Channel catfish had a W_r of 100 or greater; however, smaller inch classes had a W_r below 90. Reproduction was indicated by the catch of smaller fish. Flathead catfish were present in the reservoir, and survey results typically include only 1 or 2 flathead catfish collected during sampling. One flathead catfish was collected during the electrofishing survey in the fall of 2008.

White bass: The gill net catch rate of white bass was 4.4/nn in 2009 (Figure 6). Catch rates indicated a slight increase in relative abundance of white bass from 2006 (3.0/nn) and 2007 (2.6/nn). The W_r of white bass in 2009 ranged between 80 to just over 90. This is an improvement over 2007, in which there were no W_r greater than 90 (Figure 6).

Palmetto bass: The gill net catch rate of palmetto bass was 6.8/nn in 2009, up from 2.2/nn in 2007 and 1.8/nn in 2006 (Figure 7). Size structure shows that the majority of fish are equal to or greater than 18

inches (RSD-18 = 82). Four fish in the sample were equal to or greater than 25 inches. W_r of many of the size classes was between 80 and 90.

Largemouth bass: The electrofishing catch rate of largemouth bass was 143.0/h in 2008, similar to 2006 at 159.0/h, but much lower than 266.0/h in 2004 (Figure 8). Although the 2008 catch rate was much lower than in 2004, size structure remained similar with the majority of fish averaging less than 8 inches. An RSD-14 of 17 has fluctuated from 7 in 2006 to 20 in 2004. W_r in 2008 averaged between 80 and 90 and was similar to body condition in 2006 and lower than in 2004 (Figure 8).

White crappie: The trap net catch rate of white crappie was 2.0/nn in 2008; lower than 2004 (7.9/nn) and 2000 (9.2/nn). The PSD was 84 and was similar to the PSD in 2004 (Figure 9).

Fisheries management plan for Mackenzie Reservoir, Texas

Prepared – July 2009

ISSUE 1: Gill net catch rates for palmetto bass have shown an increasing trend over the past 4 years; however the W_r appears to have dropped slightly. It was also noticed that, although the catch rate for gizzard shad was 234.0/h, the IOV indicated that only a small portion of the gizzard shad sampled were small enough to be utilized by the palmetto bass as forage.

MANAGEMENT STRATEGY

1. In an effort to maintain a quality palmetto bass fishery, it is recommended that stocking every other year at no more than 5 per acre, based upon actual surface area of the reservoir, be continued.
2. Add an additional electrofishing survey during the 2009 sampling season to monitor the forage population.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule is a continuation of the current schedule with the addition of an electrofishing survey in the fall of 2009. It also includes electrofishing in 2010, gill netting in 2011, and mandatory monitoring surveys in 2012-2013 (Table 5).

LITERATURE CITED

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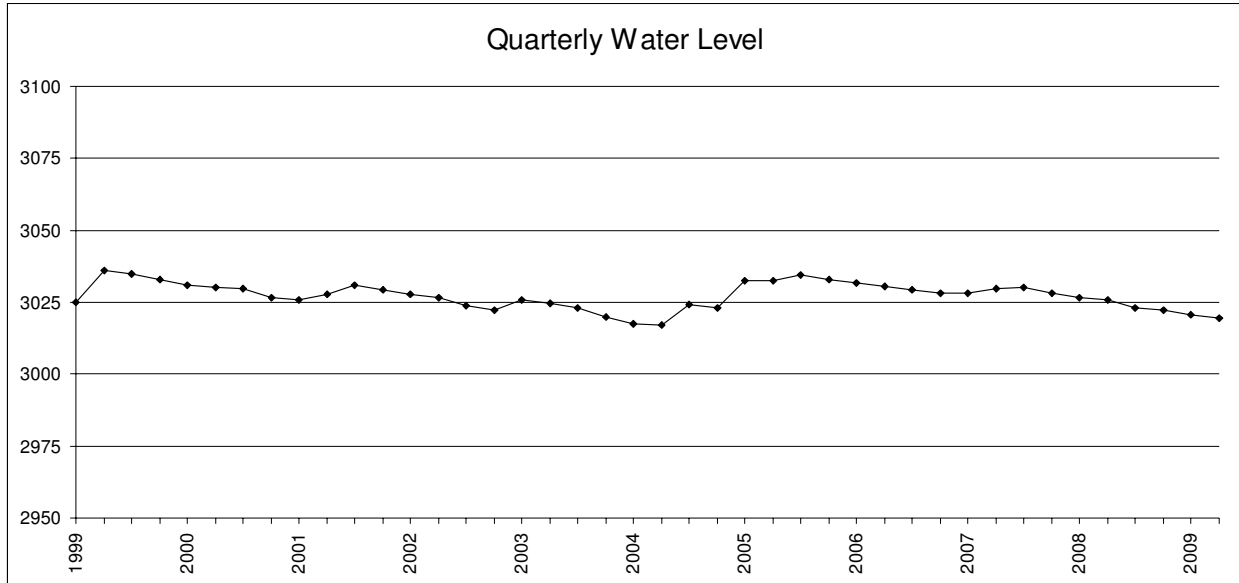


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Mackenzie Reservoir, Texas. Conservation pool elevation is 3,100 feet above mean sea level.

Table 1. Characteristics of Mackenzie Reservoir, Texas.

Characteristic	Description
Year constructed	1974
Controlling authority	Mackenzie Municipal Water Authority
County	Briscoe
Reservoir type	Mainstream
Shoreline Development Index (SDI)	6.96
Conductivity	784 μ mhos/cm

Table 2. Harvest regulations for Mackenzie Reservoir, Texas.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No limit
Catfish, flathead	5	18 - No limit
Bass, striped and hybrid striped bass	5 (in any combination)	18
Bass, white	25	10 - No limit
Bass: smallmouth and largemouth	5 (in any combination)	14 - No limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No limit
Walleye	5	No more than 2 under 16

Table 3. Stocking history of Mackenzie Reservoir, Texas. Size categories are adult (ADL), fingerling (FGL) and fry (FRY).

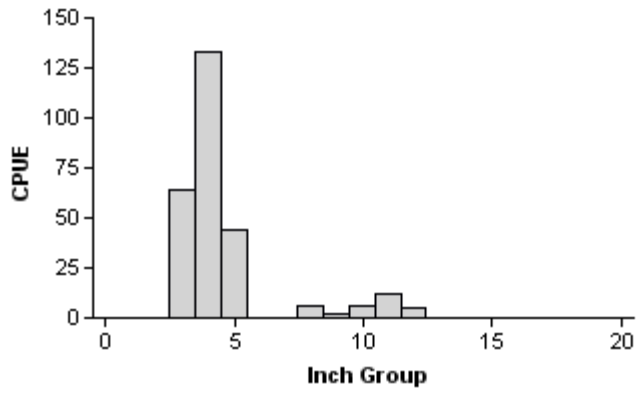
Species	Year	Number	Life Stage
Rainbow trout	1975	10,000	ADL
Brown trout	1975	5,000	ADL
Blue catfish	1980	3,000	FGL
	1982	44,998	FGL
	Total	47,998	
Channel catfish	1973	4,000	FGL
	1974	50,000	FGL
	1986	40,000	FGL
	Total	94,000	
Flathead catfish	1975	5,000	FGL
Palmetto bass	1979	5,000	FGL
	1981	10,951	FGL
	1994	13,507	FGL
	1995	13,500	FGL
	1997	9,202	FGL
	1998	9,025	FGL
	1999	13,511	FGL
	2003	9,020	FGL
	2005	8,920	FGL
	2007	9,333	FGL
Total	101,969		
Florida largemouth bass	1982	20,680	FGL
	1988	35,400	FGL
	1993	90,194	FGL
	1994	44,944	FGL
	Total	191,218	
Smallmouth bass	1976	10,600	FGL
	1977	39,800	FGL
	1978	50,000	FGL
	Total	100,400	
Walleye	1976	350,000	FRY
	1977	180,000	FRY
	1978	350,000	FRY
	1983	1,122,000	FRY
	1984	720,000	FRY
	1985	630,000	FRY
Total	3,352,000		

Table 4. Habitat survey of littoral zone and physical habitat types, Mackenzie Reservoir, Texas, August 26, 2008. A linear shoreline distance (miles) was recorded for each habitat type found. Percent indicated is percent of total shoreline distance.

Habitat	Type	Shoreline Distance	
		Miles	Percent
Land-water Interface	Rocky or gravel shoreline	3.4	56.7
	Featureless	1.5	24.8
	Featureless + standing flooded timber	0.9	14.3
	Bulkhead + piers	0.2	2.8
	Rock bluff	0.1	1.4

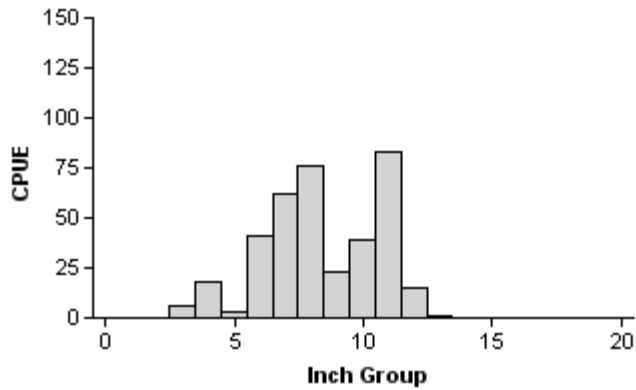
Gizzard Shad

2004



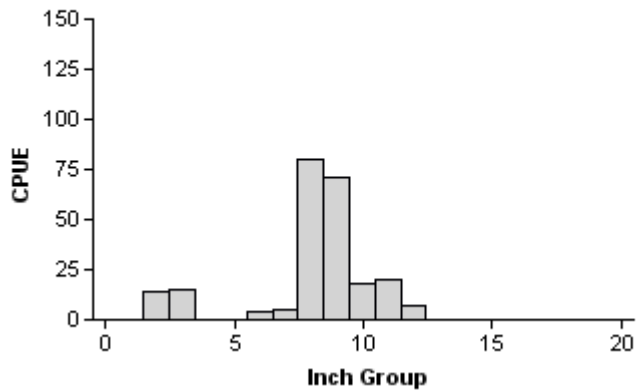
Effort = 1.0
 Total CPUE = 272.0 (32; 272)
 Stock CPUE = 31.0 (32; 31)
 IOV = 9 (3.0)

2006



Effort = 1.0
 Total CPUE = 367.0 (20; 367)
 Stock CPUE = 299.0 (19; 299)
 IOV = 35 (8.5)

2008



Effort = 1.0
 Total CPUE = 234.0 (22; 234)
 Stock CPUE = 201.0 (22; 201)
 IOV = 16 (7.4)

Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2004, 2006, and 2008.

Bluegill

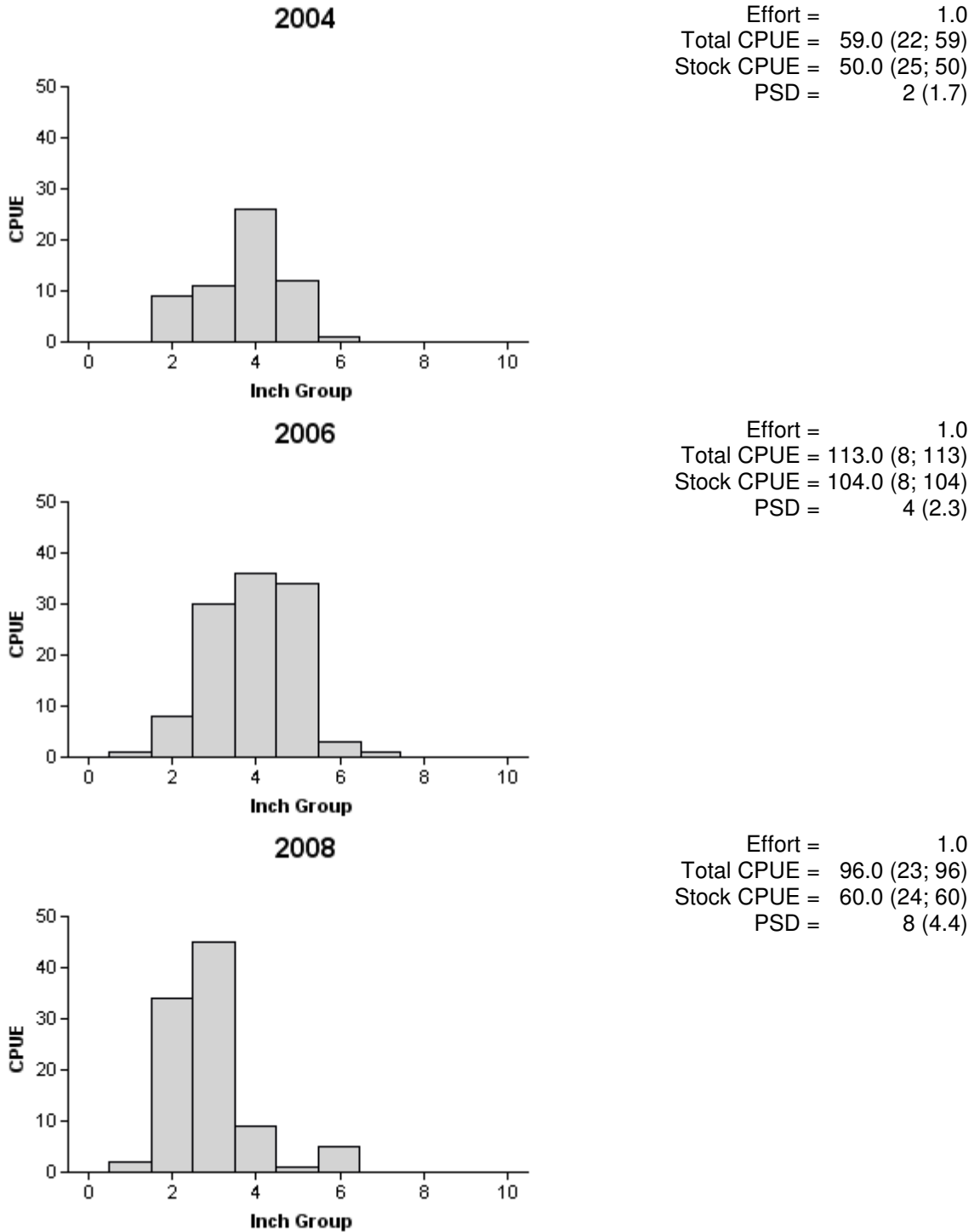


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2004, 2006, and 2008.

Blue Catfish

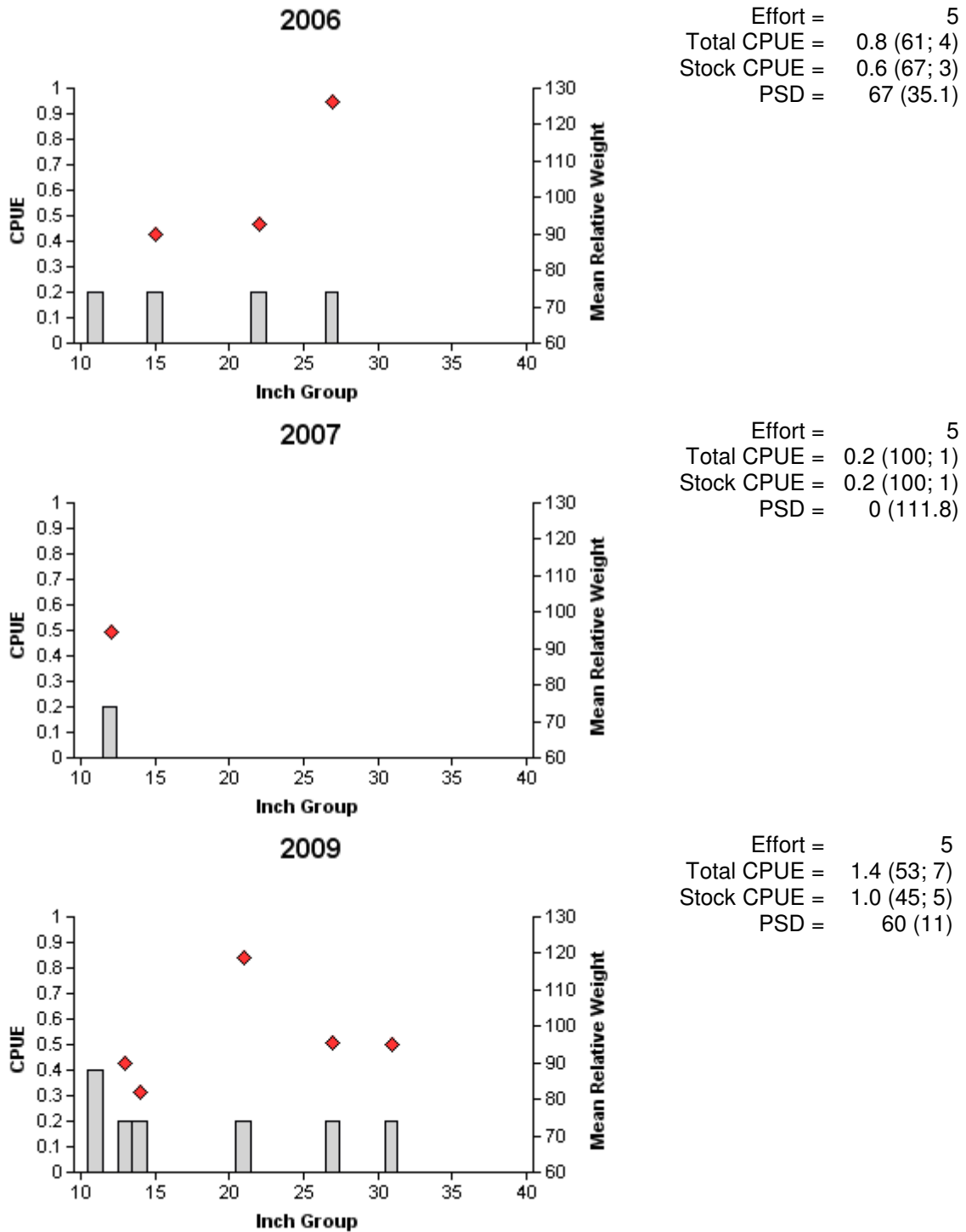


Figure 4. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mackenzie Reservoir, Texas, 2006, 2007, and 2009.

Channel Catfish

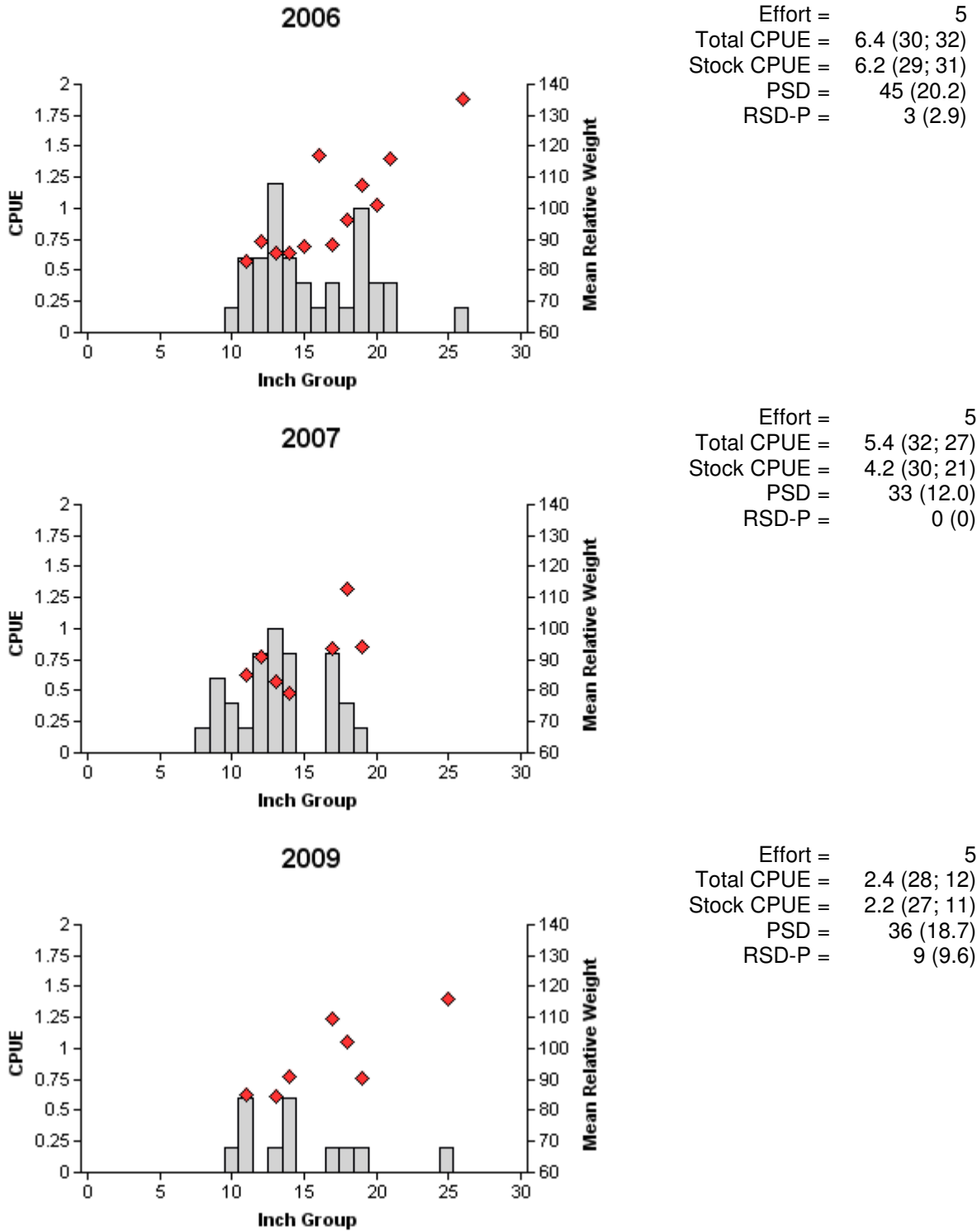


Figure 5. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mackenzie Reservoir, Texas, 2006, 2007, and 2009.

White Bass

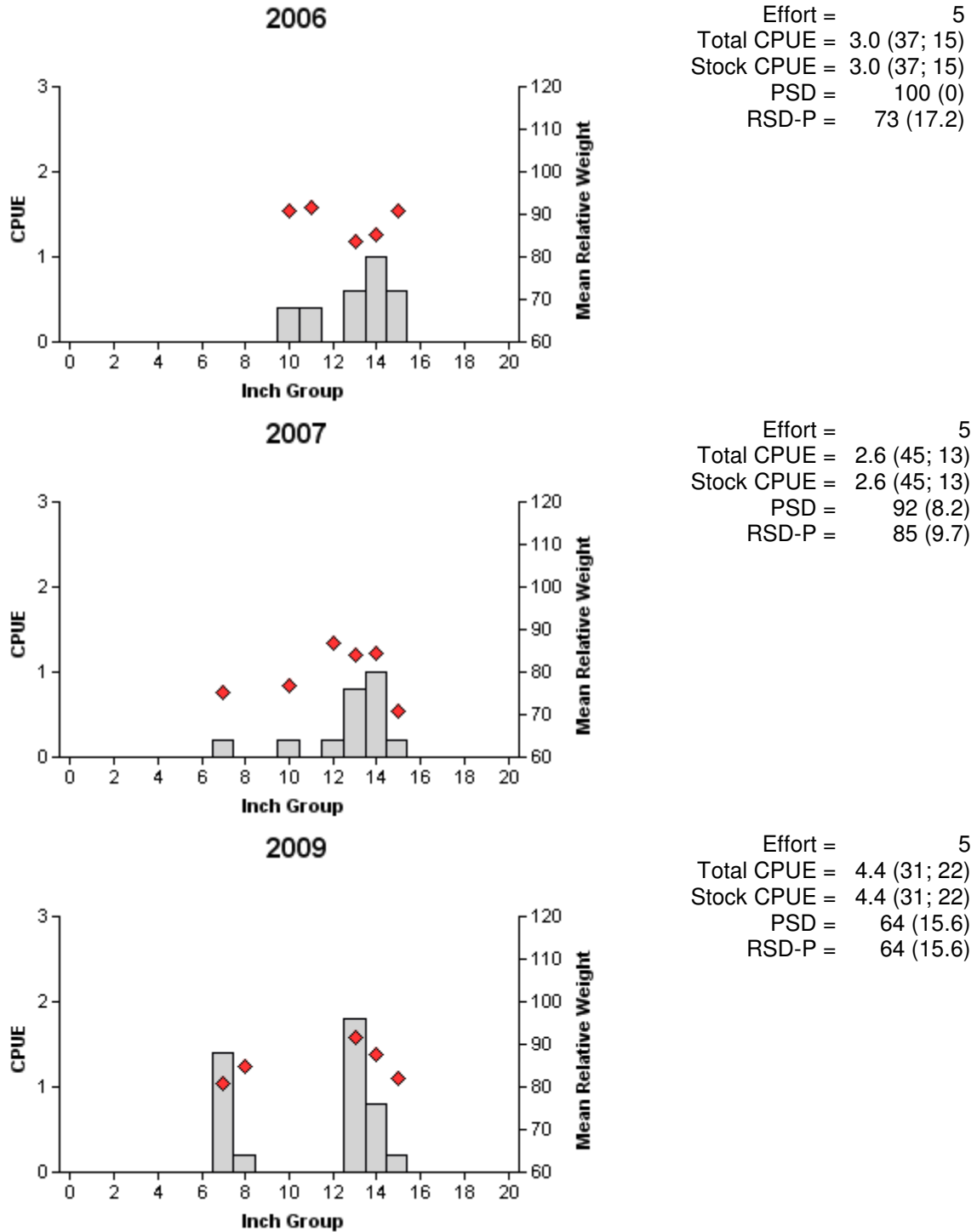


Figure 6. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Mackenzie Reservoir, Texas, 2006, 2007, and 2009.

Palmetto Bass

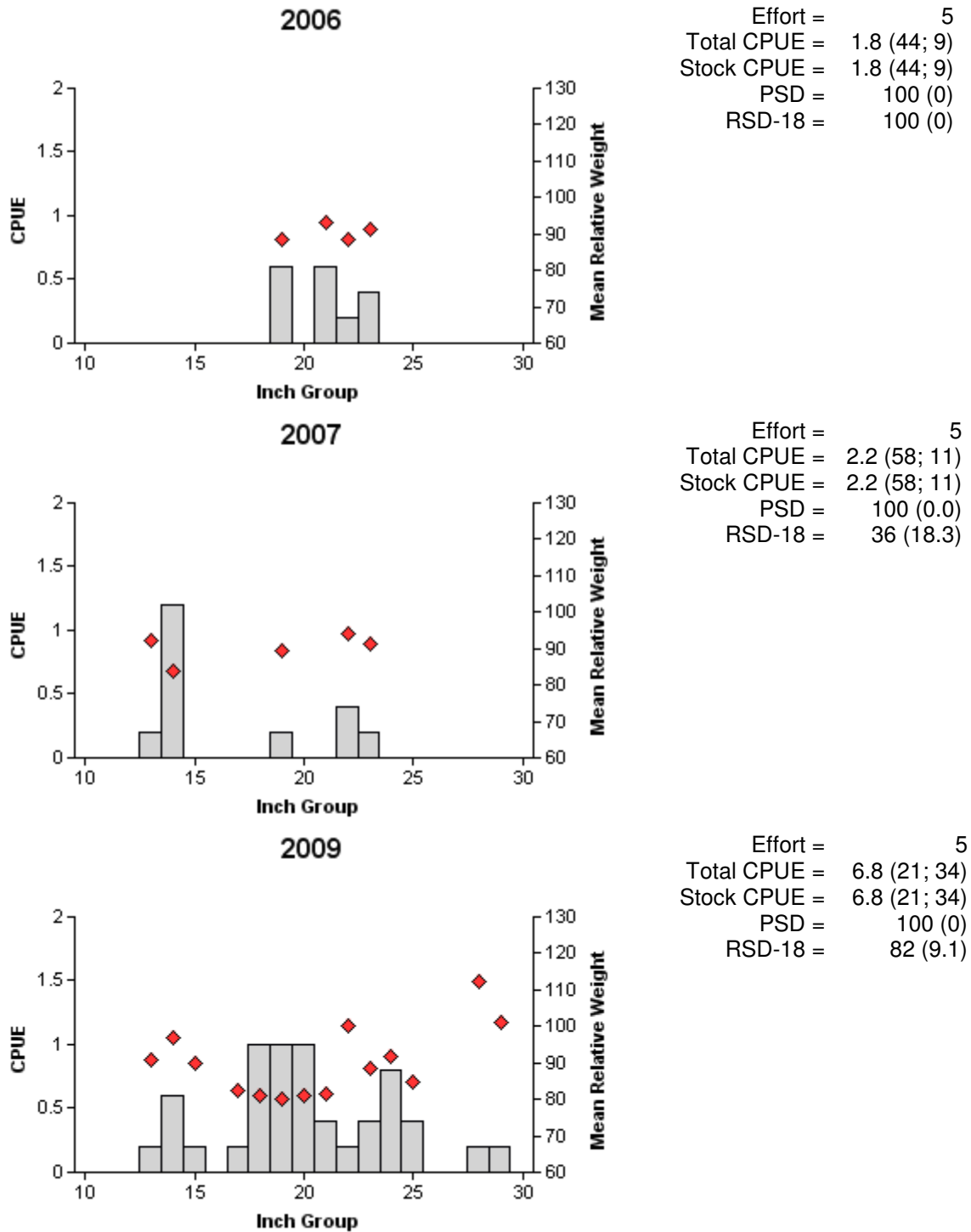


Figure 7. Number of palmetto bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill netting surveys, Mackenzie Reservoir, Texas, 2006, 2007, and 2009.

Largemouth Bass

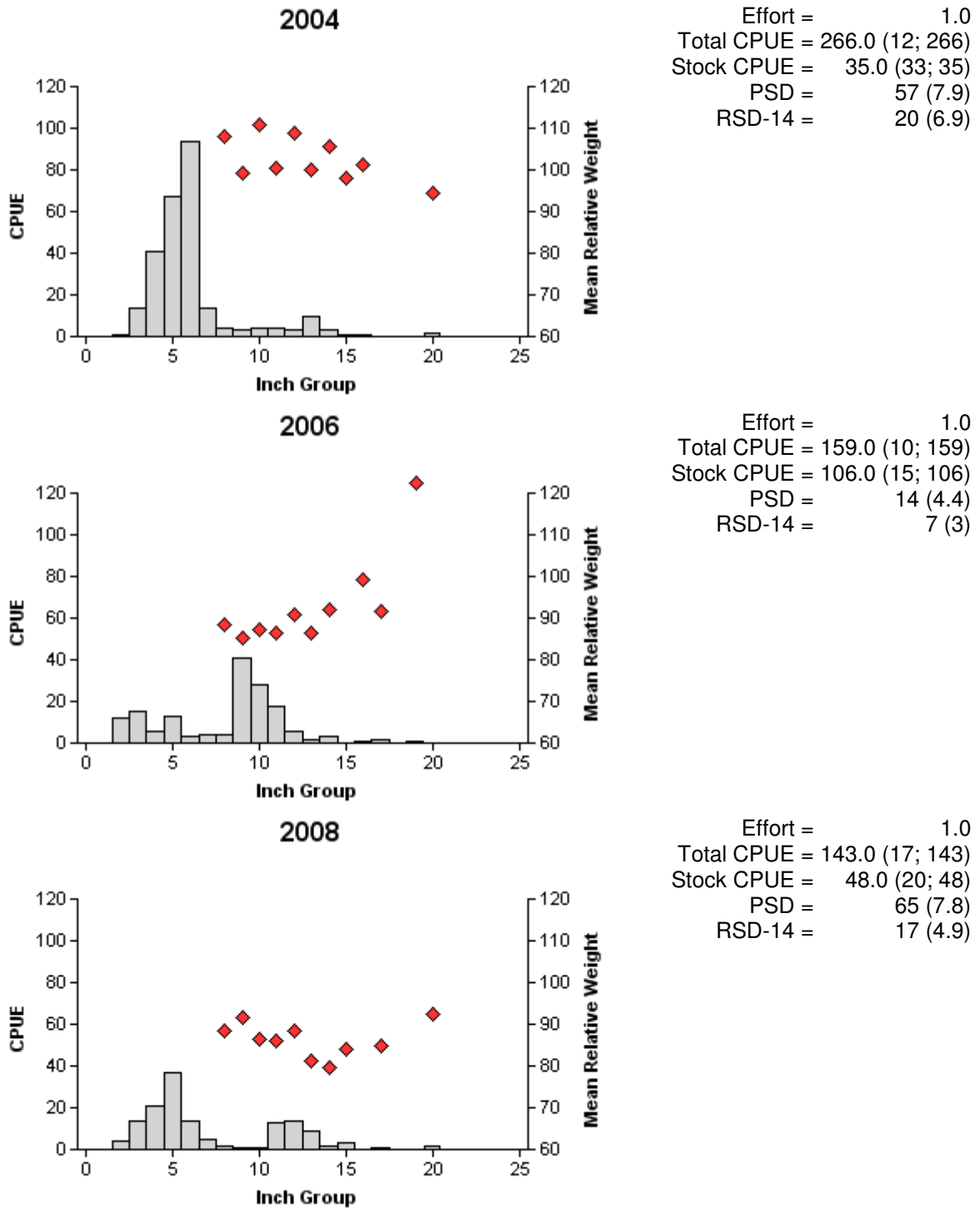
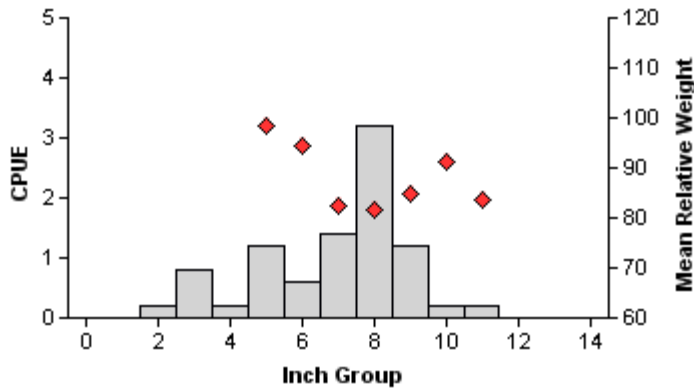


Figure 8. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2004, 2006, and 2008.

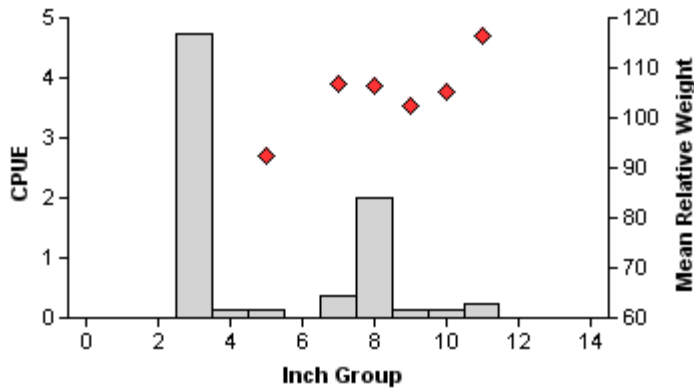
White Crappie

2000



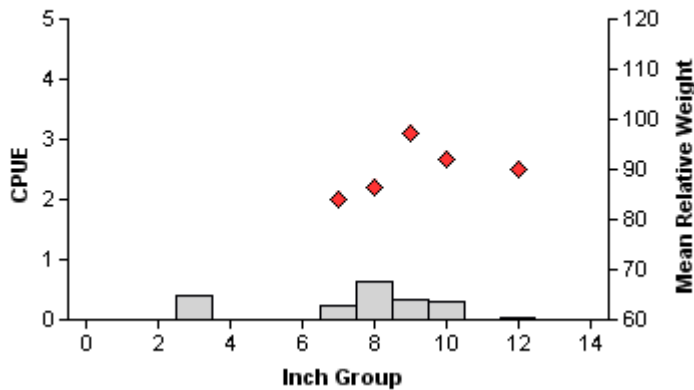
Effort = 5
 Total CPUE = 9.2 (66; 46)
 Stock CPUE = 8.0 (73; 40)
 PSD = 60 (6.1)
 RSD-10 = 5 (1.5)

2004



Effort = 8
 Total CPUE = 7.9 (51; 63)
 Stock CPUE = 3.0 (35; 24)
 PSD = 83 (10.0)
 RSD-10 = 12 (6.8)

2008



Effort = 20
 Total CPUE = 2.0 (30; 40)
 Stock CPUE = 1.6 (32; 32)
 PSD = 84 (8.1)
 RSD-10 = 22 (6.5)

Figure 9. 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 net surveys, Mackenzie Reservoir, Texas, 2000, 2004, and 2008.

Table 5. Proposed sampling schedule for Mackenzie 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.

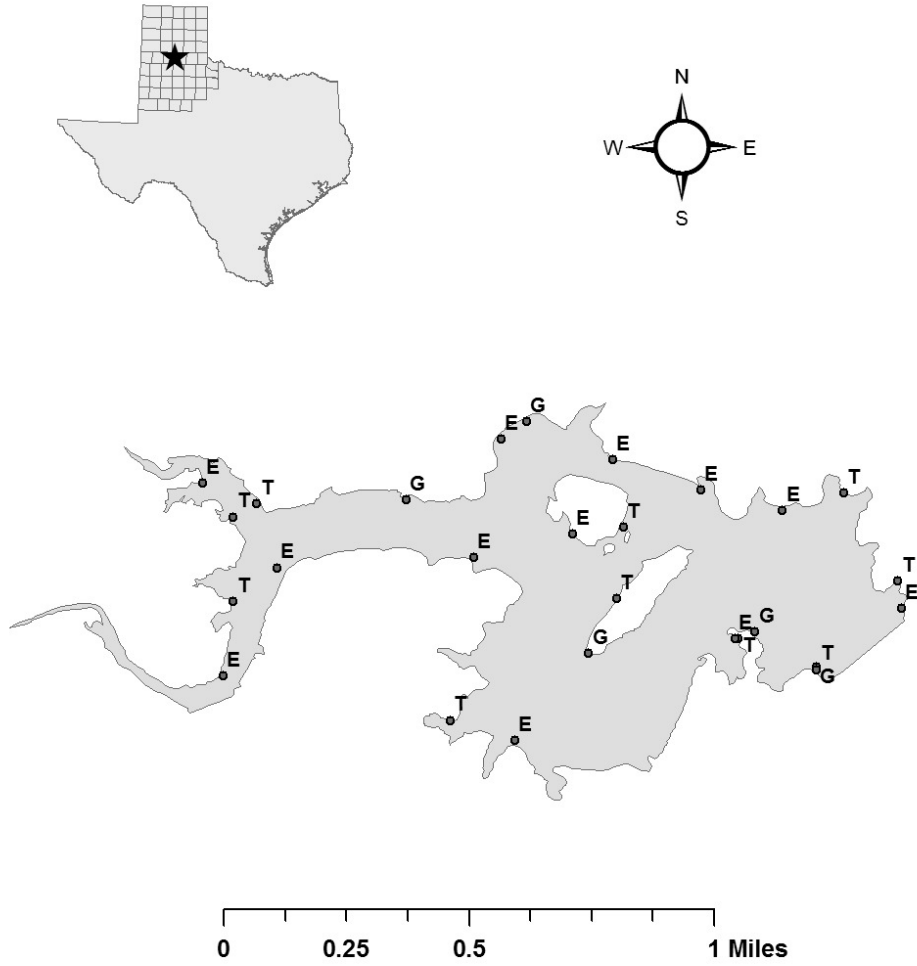
Survey Year	Electrofishing	Trap Net	Gill Net	Report
Fall 2009-Spring 2010	A			
Fall 2010-Spring 2011	A		A	
Fall 2011-Spring 2012				
Fall 2012-Spring 2013	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Mackenzie Reservoir, Texas, 2008-2009.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	77	15.4	1	0.05	234	234.0
Common carp					46	46.0
River carpsucker	1	0.2				
Blue catfish	7	1.4				
Channel catfish	12	2.4			16	16.0
Flathead catfish					1	1.0
White bass	22	4.4			37	37.0
Palmetto Bass	34	6.8	7	0.35	1	1.0
Green sunfish			1	0.05	51	51.0
Warmouth					1	1.0
Orangespotted sunfish			1	0.05		
Bluegill			22	1.10	96	96.0
Longear sunfish				0.40	68	68.0
Smallmouth bass					2	2.0
Largemouth bass	4	0.8	4	0.20	143	143.0
White crappie	14	2.8	40	2.00	5	5.0
Walleye	1	0.2			1	1.0

APPENDIX B



Location of sampling sites, Mackenzie Reservoir, Texas, 2008-2009. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.