

PERFORMANCE REPORT

As Required By

FEDERAL AID IN SPORT FISH RESTORATION ACT

FEDERAL AID PROJECT F-30-R-29

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2004 Survey Report

**Mackenzie Reservoir**

*Prepared by:*

Jason Henegar, Assistant District Management Supervisor

Inland Fisheries Division  
District I-A, Canyon, Texas



Robert L. Cook  
Executive Director

Philip P. Durocher  
Director, Inland Fisheries

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## EXECUTIVE SUMMARY

Mackenzie Reservoir was surveyed in the fall of 2004 using electrofishing and trap nets and in the spring of 2005 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:** 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, west of State Highway 207, in Briscoe County, Texas. The reservoir is owned by the Mackenzie Municipal Water Authority and provides water to four member cities. 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. Mackenzie Reservoir currently has an elevation of 3,032 FMSL and a surface area of approximately 600 acres. Since impoundment, the reservoir has never caught sufficient runoff to fill to capacity. Angler and boat access is adequate but there are no handicap specific facilities. Habitat consisted primarily of boulder, rock bluff, and flooded terrestrial vegetation.
- Prey species:** The electrofishing catch rate for gizzard shad in 2004 was 272.0/hour (h), higher than 2002 and 2000 (157.0/h and 69.0/h respectively). The gizzard shad population had an index of vulnerability (IOV) of 89% in 2004, which indicates that the majority of the population is available to most predators. The index of vulnerability has improved from 33% since 2000.

The electrofishing catch rate for bluegills in 2004 was 59.0/h, lower than the catch rate in 2002 (123.0/h). The size range of sampled bluegills indicated good availability to existing predators. There was no directed angling effort for bluegill in the 2004 creel survey.
- Blue catfish:** The gill net catch rate for blue catfish in 2005 was 0.2/net night (NN), lower than the 2001 catch rate of 0.8/NN. There was no directed angling effort for blue catfish. However, there was one individual documented in the 2004 creel as harvested. Any blue catfish harvest was by anglers targeting catfish in general or by those not targeting any particular species of fish. No age and growth analysis was done from 1996 to 2005 because of small sample sizes.
- Channel catfish:** The gill net catch rate for channel catfish in 2005 was 4.4/NN, higher than 2003 (3.0/NN) and similar to 2001 (4.8/NN). The population size structure for channel catfish was favorable as 82% of the fish collected were of harvestable size. No age and growth analysis was done during 2003 and 2005 because of small sample sizes. Channel catfish received 4.72 h/acre of angler directed effort during the 2004 creel survey. The catch rate for anglers seeking channel catfish was 0.05/h and the harvest rate was 0.04/h. Channel catfish were the most (45% of angler hrs) targeted species by anglers.
- White bass:** The gill net catch rate of white bass in 2005 was 4.4/NN, up from 2003 (3.0/NN) and 2001 (1.6/NN). White bass received no directed angling effort, and no fish were documented as being caught in the 2004 creel survey.
- Palmetto bass:** The gill net catch rate of palmetto bass in 2005 was 0.4/NN, down from 2003 and 2001 (8.2/NN and 11.4/NN, respectively). Catch rates may have declined from previous years, due to record low water levels during 2004 or a missed stocking in 2001 due to a fish kill at the hatchery. Palmetto bass received 1.73 h/acre of angler directed effort during the 2004 creel survey. The catch rate for anglers seeking palmetto bass was 0.28/h and the harvest rate was 0.09/h. Results from 2004 creel, indicated that palmetto bass were the fourth most target species (12% of angler effort) in Mackenzie Reservoir.
- Largemouth bass:** The electrofishing catch rate of largemouth bass in 2004 was 266.0/h, higher than 2003 (68.0/h) and 2000 (141.0/h). In 2004, Electrophoresis indicated a 22% frequency of Florida largemouth bass alleles with 0% of the population having Florida largemouth bass genotypes. This is above the target range of 20% Florida largemouth bass alleles. Directed angling effort for largemouth bass was 2.03 h/acre during the 2004 creel survey. The catch rate for anglers seeking largemouth bass was 0.32/h and the harvest rate was 0.01/h.
- White crappie:** The trap net catch rate for white crappie in 2004 was 7.9/net night, lower than the 2000 catch rate of 9.2/NN. White crappie received 0.49 h/acre of angler directed effort during the 2004 creel survey. The catch rate for anglers seeking white crappie was 0.81/h and the harvest rate was 0.00/h.

- **Walleye:** The gill net catch rate for walleye in 2004 was 0.2 /NN, down from 2000 (1.0/NN). Growth rates were not calculated in 2004 or 2000 because of small sample sizes. Walleye received no directed angling effort, and no fish were documented as being caught in the 2004 creel survey. Mackenzie Reservoir is not currently being managed as a walleye fishery.

- **Management Strategies**

Based on current information, the reservoir should continue to be managed with existing regulations. A quality palmetto bass population has existed in Mackenzie Reservoir. Catch rates for the 2005 gill net survey could have been a result of record low water levels during 2004. In addition, palmetto bass populations need to be maintained by stocking. Thus, it is recommended that palmetto bass be stocked on the current schedule of every other year at a 5-10 per acre. The palmetto bass fishery should be promoted to the public through the use of press releases.

## INTRODUCTION

This document is a summary of fisheries data collected from Mackenzie Reservoir in the fall of 2004 and the spring of 2005. The purpose of this document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While data on other fish species were collected, this report deals primarily with the major sport fishes and important prey species. Management strategies are included to address existing problems or opportunities. Historical data is presented with the 2004 - 2005 data for comparison.

Status of Management Actions from 2001 (Van Zee 2001)

Issue 1            Maintain and promote the quality hybrid striped (palmetto) bass fishery at Mackenzie Reservoir.

Management Action

1.            Promote the hybrid striped (palmetto) bass fishery through the use of press releases to area newspapers.
2.            Stock hybrid striped (palmetto) bass at a rate of 5-10 per acre every other year to maintain the quality fishery.

Harvest regulations for Mackenzie Reservoir.

Species	Bag Limit	Length Limit Inches
Bass, largemouth and smallmouth	5	14 Minimum
Bass, striped, its hybrids and subspecies	5	18 Minimum
Bass, white	25	10 Minimum
Catfish, flathead	5	18 Minimum
Catfish, blue and channel	25	12 Minimum
Crappie, white	25	10 Minimum
Walleye	5	No more than 2 under 16

## METHODS

- Fish were sampled using electrofishing, gill net, and trap net surveys at random sites.
- No significant man-made changes have occurred at the reservoir since 2000 (Van Zee 2001) so habitat surveys were not conducted.
- Sampling statistics: Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour of actual sampling time (number/h), and for gill and trap nets as the number of fish caught in one net set overnight (number/net night). Proportional stock density (PSD) and relative stock density (RSD) indices were used to assess population size structure, while mean relative weights ( $\bar{W}_r$ ) were used to assess condition of target fishes at time of sampling (Anderson and Neumann 1996). The index of vulnerability (IOV; DiCenzo et al. 1996) was used to determine the percentage of the gizzard shad population most vulnerable to predation.
- Age and growth analysis was not performed on all target species because of small sample sizes.
- A 6-month creel survey (April – September; 20 days in 2003 with 10 days/quarter and 18 days in 2004 with 9 days/quarter) was conducted to assess angler use and catch.
- All sampling was conducted according to Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004).

## LITERATURE CITED

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, second edition. American Fisheries Society, Bethesda, Maryland.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Van Zee, B. 2001. Statewide freshwater fisheries monitoring and management program survey report for: Mackenzie Reservoir, 2000. Texas Parks and Wildlife Department, Federal Aid In Sport Fish Restoration, Grant F-30-R, Performance Report, Austin.

Physical and historical data for Mackenzie Reservoir, Texas, 2004 - 2005.

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Inland Fisheries water body code: 0485

IF District: IA - Canyon

Controlling Authority: Mackenzie Municipal Water Authority

Water Uses: Water supply, recreation

Conservation pool (FMSL): 3,100

Surface acres at conservation pool: 900

2005 Elevation (FMSL): 3,032

2005 Acreage: 600

Location: 79 miles S of Amarillo

Counties: Briscoe

Latitude: 34° 39'

Longitude: 101° 50'

Nearest major metropolitan area and distance: Amarillo 79 miles

Reservoir description: Main stream

River: Tule Creek in the Red

River Basin

Mean depth (ft): 52.4

Maximum depth (ft): 150.0

Shoreline development ratio: 6.96

Watershed (mi<sup>2</sup>): 188

Secchi disc range (ft): > 5

Conductivity (umhos/cm): 611

Constructed: 1974

Access: Boat: Adequate - 2 ramps

Bank: Adequate - 4 areas

Handicap: Inadequate - None

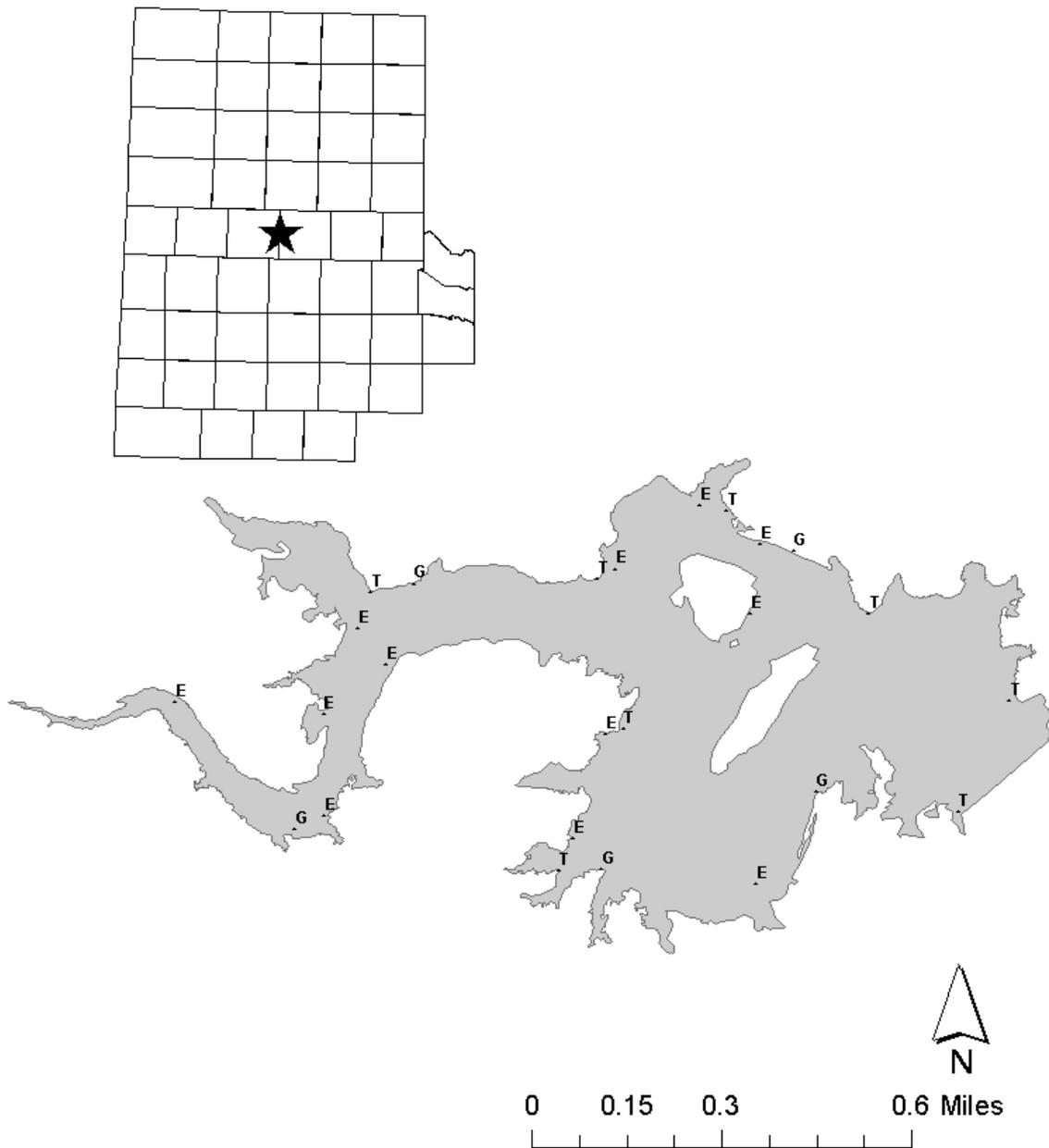
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Stocking history of Mackenzie Reservoir, Texas. Size categories are ADL for adult, FGL for fingerling, and FRY for fry.

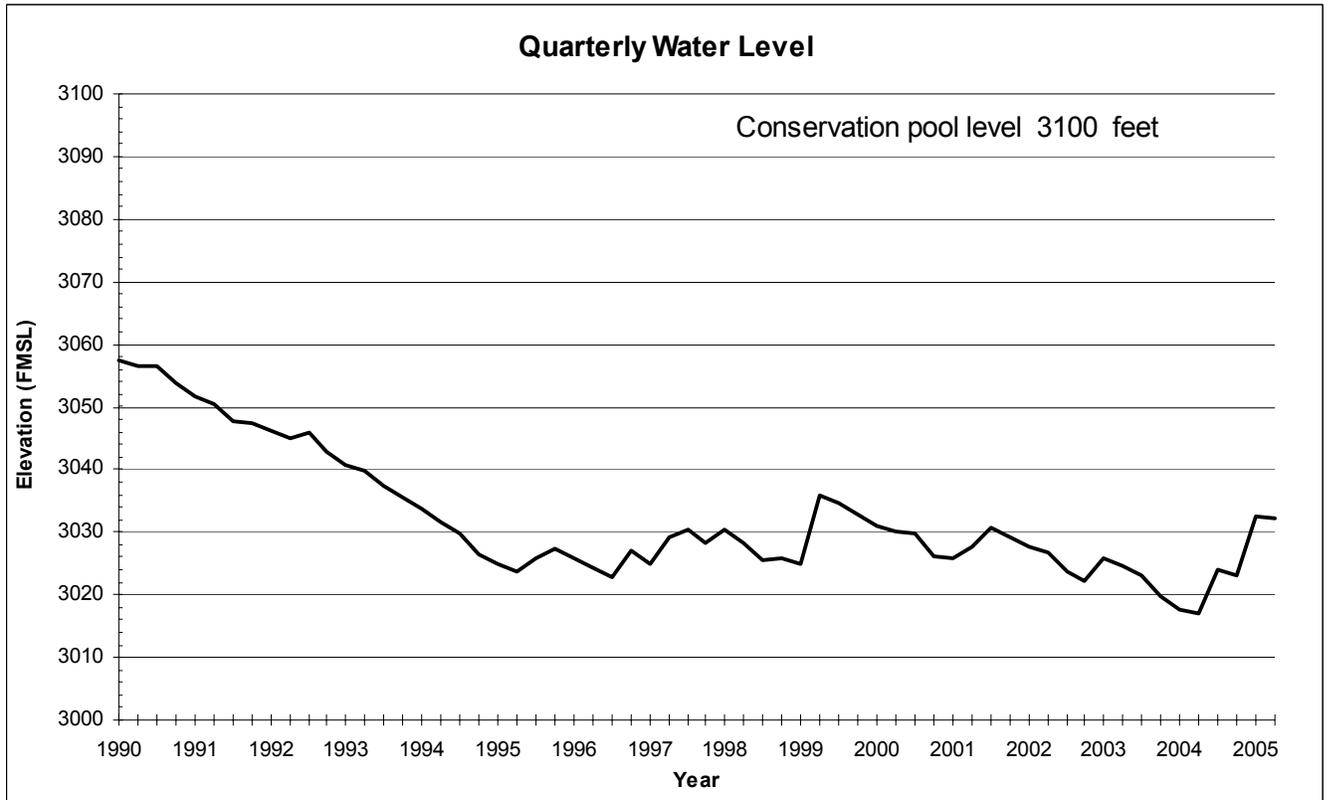
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Rainbow trout			Smallmouth bass		
1975	10,000	ADL	1976	10,600	FGL
			1977	39,800	FGL
Brown trout			1978	<u>50,000</u>	FGL
1975	5,000	ADL	Species Total	100,400	
Blue catfish			Florida largemouth bass		
1980	3,000	FGL	1982	20,680	FGL
1982	<u>44,998</u>	FGL	1988	35,400	FGL
Species Total	47,998		1993	90,194	FGL
			1994	<u>44,944</u>	FGL
Channel catfish			Species Total	191,218	
1973	4,000	FGL			
1974	50,000	FGL	Walleye		
1986	<u>40,000</u>	FGL	1976	350,000	FRY
Species Total	94,000		1977	180,000	FRY
			1978	350,000	FRY
Flathead catfish			1983	1,122,000	FRY
1975	5,000	FGL	1984	720,000	FRY
			1985	<u>630,000</u>	FRY
Palmetto bass			Species Total	3,352,000	
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	9020	FGL			
2005	<u>8920</u>	FGL			
Species Total	92,636				

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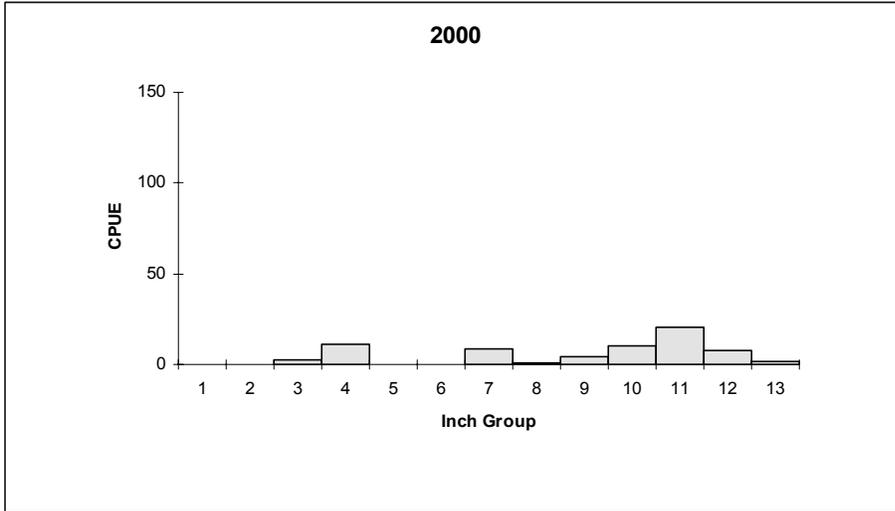


Location of random sampling sites for Mackenzie Reservoir, Texas, during 2004 - 2005. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.

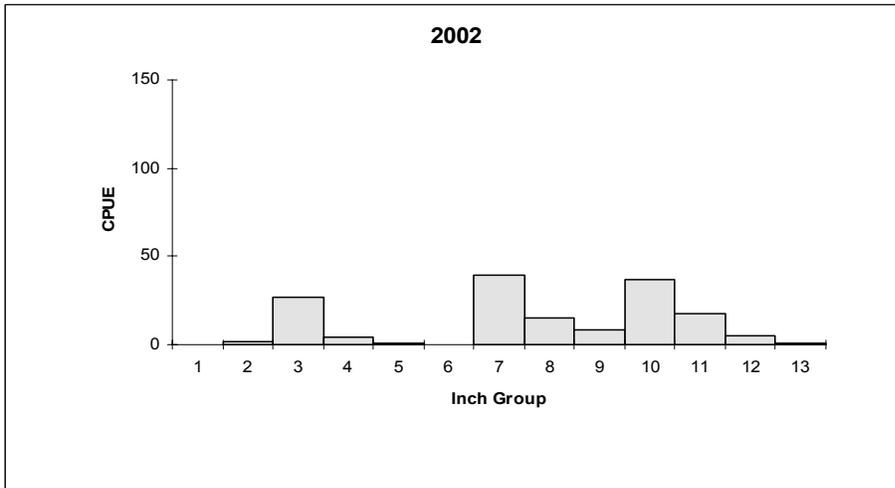


Quarterly water level elevations in feet above mean sea level (FMSL) recorded for Mackenzie Reservoir, Texas.

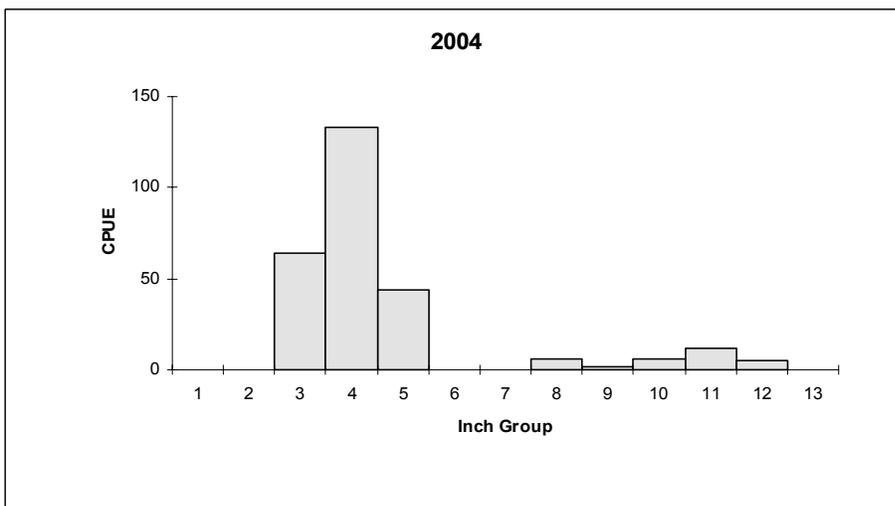
**Gizzard Shad**



Effort = 1.0  
 Total CPUE = 69.0  
 Stock CPUE = 55.0  
 PSD = 56  
 IOV = 33



Effort = 1.0  
 Total CPUE = 157.0  
 Stock CPUE = 127.0  
 PSD = 20  
 IOV = 46



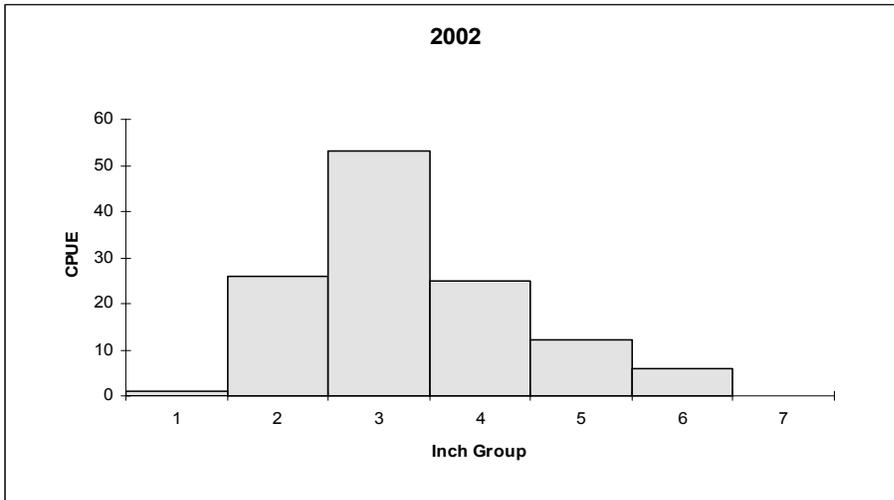
Effort = 1.0  
 Total CPUE = 272.0  
 Stock CPUE = 31.0  
 PSD = 55  
 IOV = 89

Comparison of the number of gizzard shad caught per hour (CPUE) and population indices for fall electrofishing surveys, Mackenzie Reservoir, Texas.

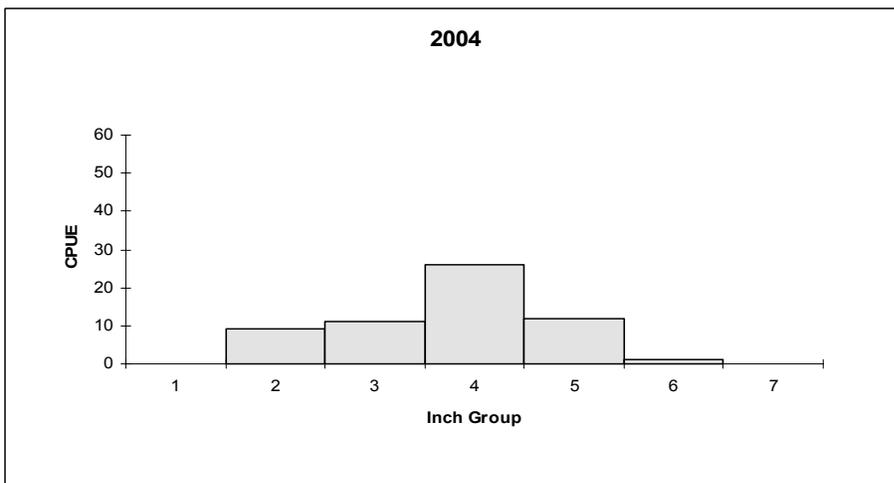
**Bluegill**



Effort = 1.0  
 Total CPUE = 118.0  
 Stock CPUE = 114.0  
 PSD = 12  
 RSD-8 = 0



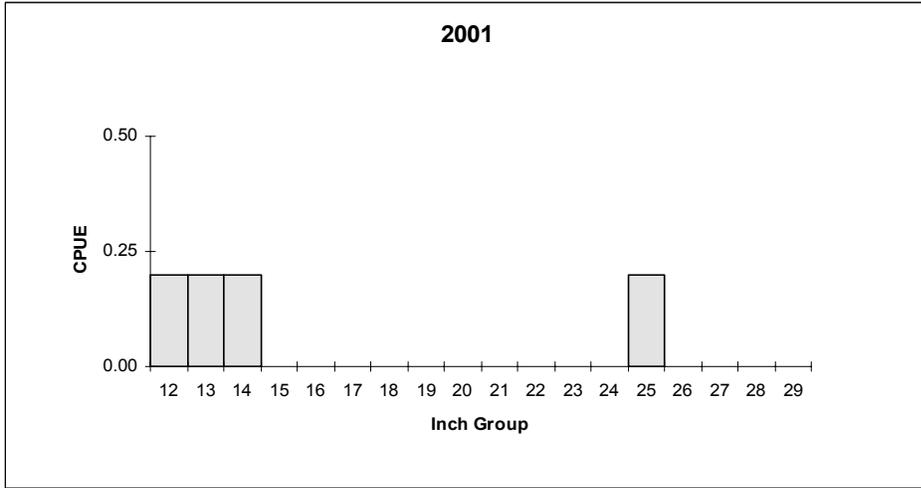
Effort = 1.0  
 Total CPUE = 123.0  
 Stock CPUE = 96.0  
 PSD = 6  
 RSD-8 = 0



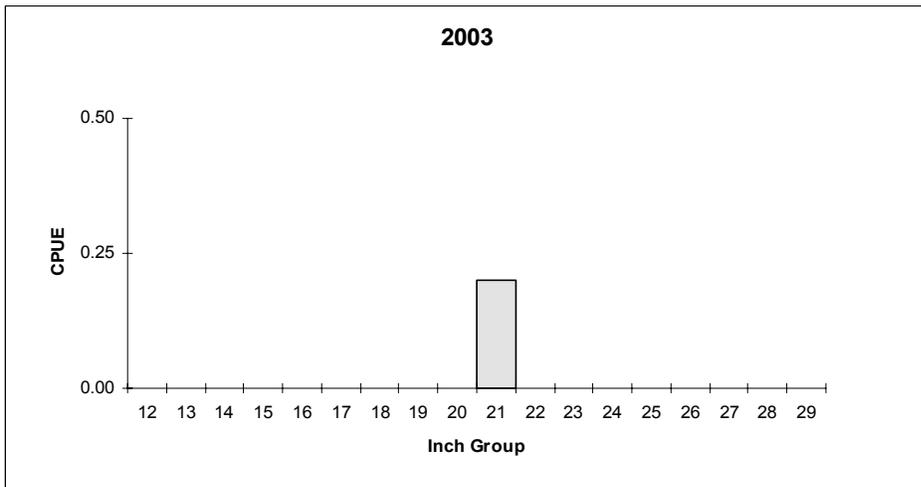
Effort = 1.0  
 Total CPUE = 59.0  
 Stock CPUE = 50.0  
 PSD = 2  
 RSD-8 = 0

Comparison of the number of bluegill caught per hour (CPUE) and population indices for fall electrofishing surveys Mackenzie Reservoir, Texas.

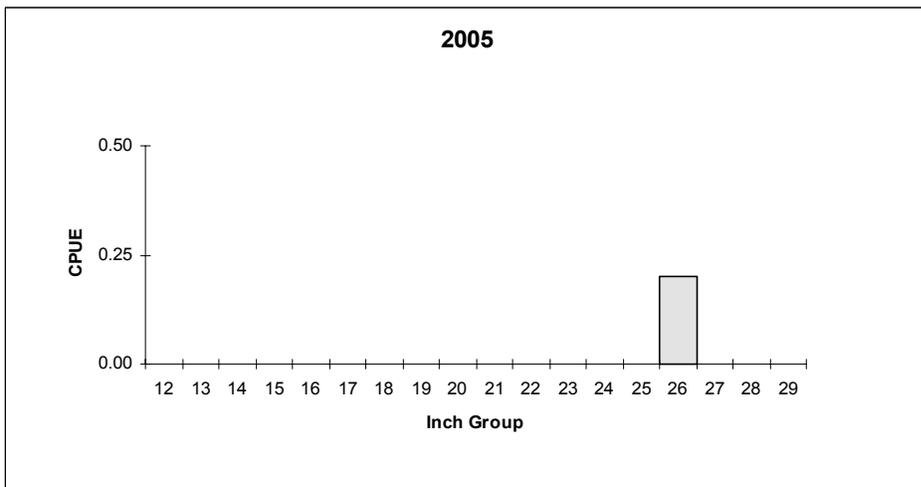
**Blue Catfish**



Effort = 5  
 Total CPUE = 0.8  
 Stock CPUE = 0.8  
 PSD = 25



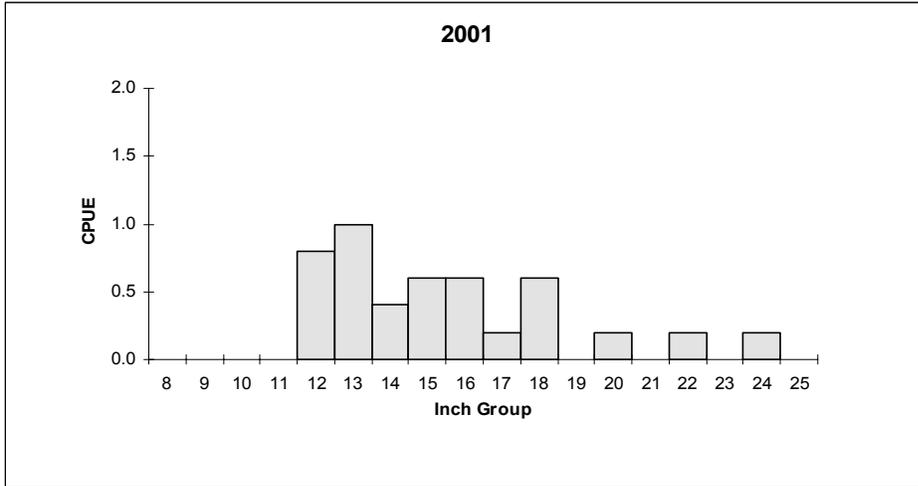
Effort = 5  
 Total CPUE = 0.2  
 Stock CPUE = 0.2  
 PSD = 100



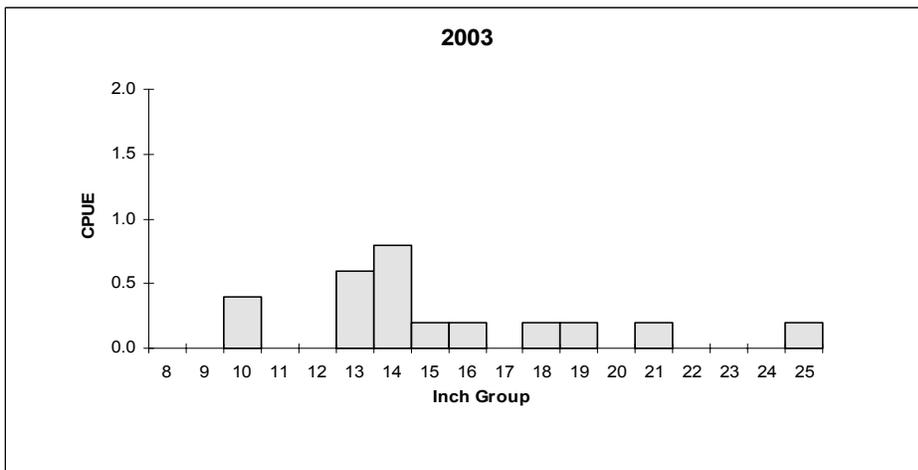
Effort = 5  
 Total CPUE = 0.2  
 Stock CPUE = 0.2  
 PSD = 100

Comparison of the number of blue catfish caught per net night (CPUE), and population indices for spring gill net collections, Mackenzie Reservoir, Texas.

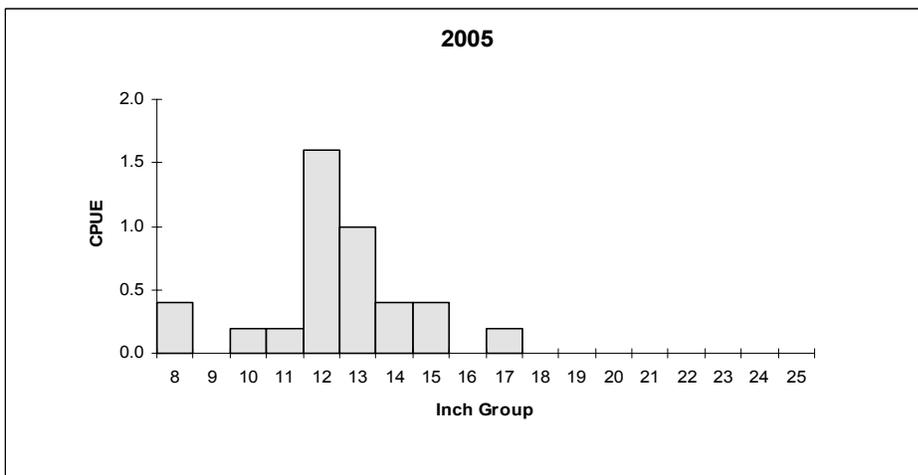
**Channel Catfish**



Effort = 5  
 Total CPUE = 4.8  
 Stock CPUE = 4.8  
 PSD = 42  
 RSD-12 = 100



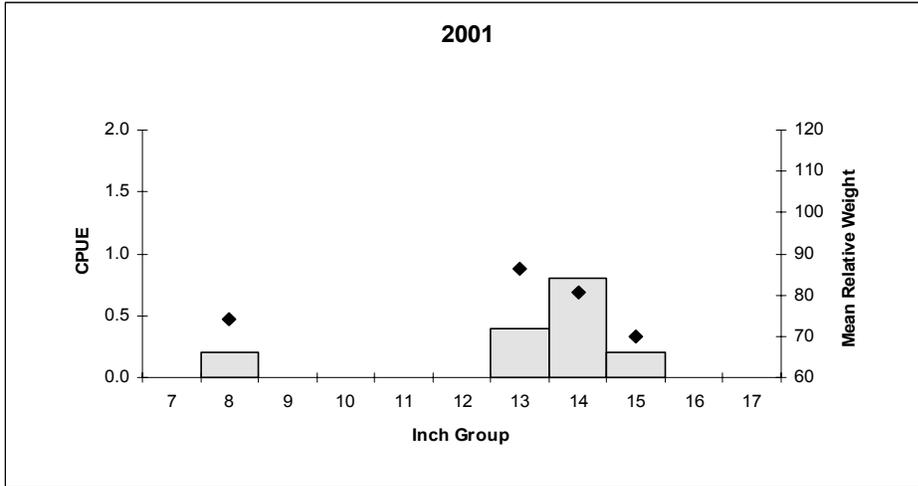
Effort = 5  
 Total CPUE = 3.0  
 Stock CPUE = 2.6  
 PSD = 38  
 RSD-12 = 100



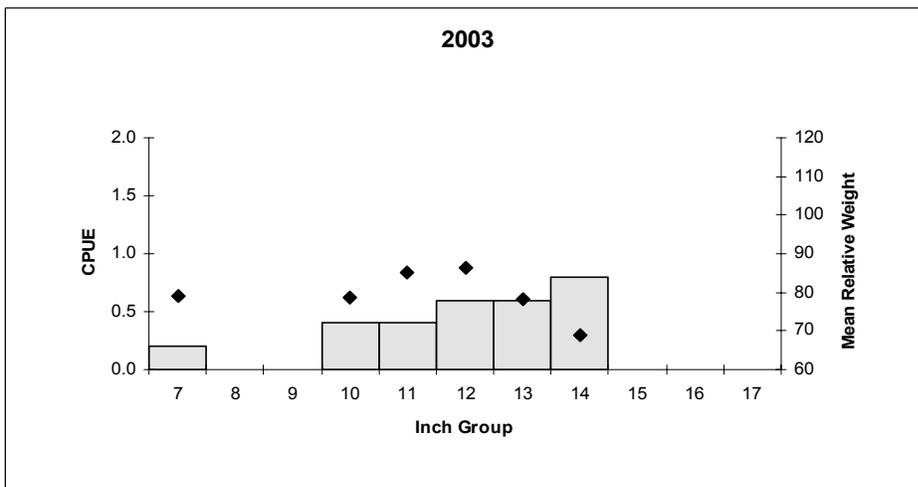
Effort = 5  
 Total CPUE = 4.4  
 Stock CPUE = 3.8  
 PSD = 5  
 RSD-12 = 95

Comparison of the number of channel catfish caught per net night (CPUE), and population indices for spring gill net collections, Mackenzie Reservoir, Texas.

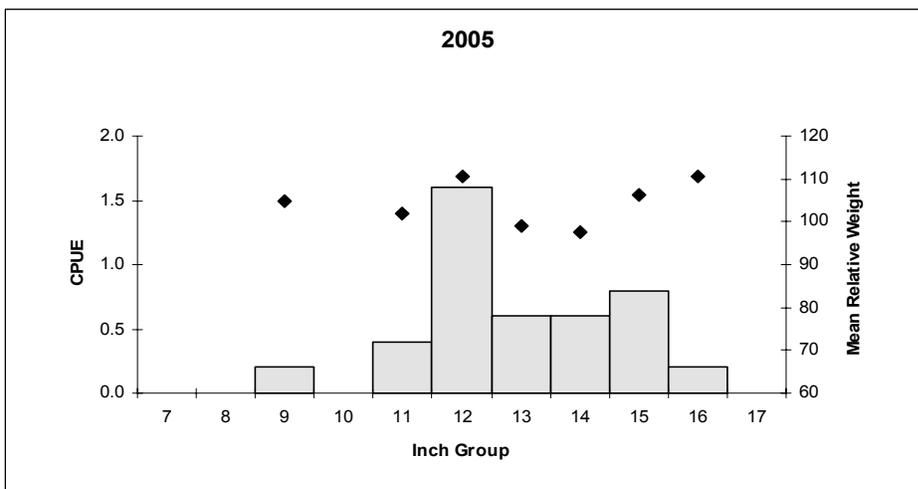
**White Bass**



Effort = 5  
 Total CPUE = 1.6  
 Stock CPUE = 1.6  
 PSD = 88  
 RSD-10 = 88



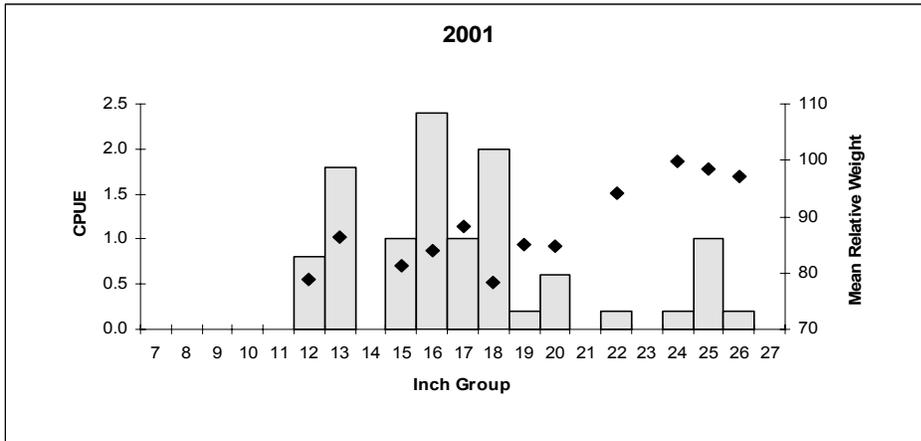
Effort = 5  
 Total CPUE = 3.0  
 Stock CPUE = 3.0  
 PSD = 93  
 RSD-10 = 93



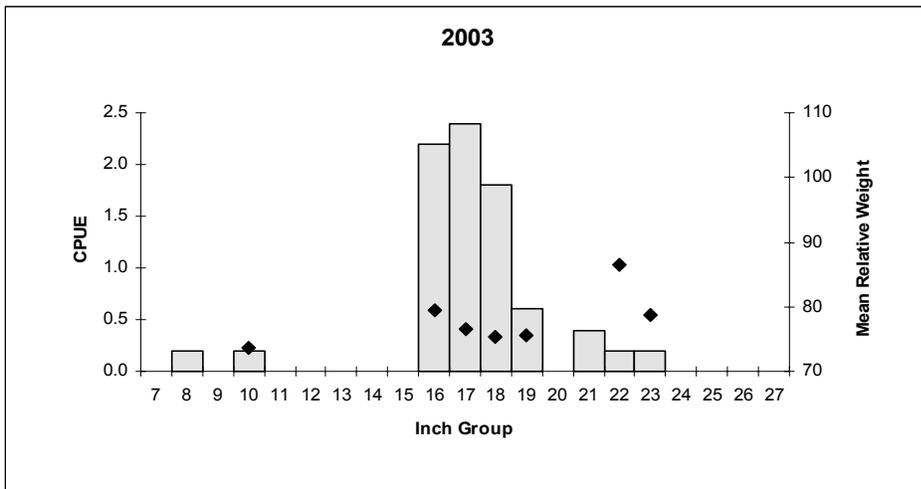
Effort = 5  
 Total CPUE = 4.4  
 Stock CPUE = 4.4  
 PSD = 100  
 RSD-10 = 95

Comparison of the number of white bass caught per net night (CPUE), mean relative weight (diamonds), and population indices for spring gill net collections, Mackenzie Reservoir, Texas.

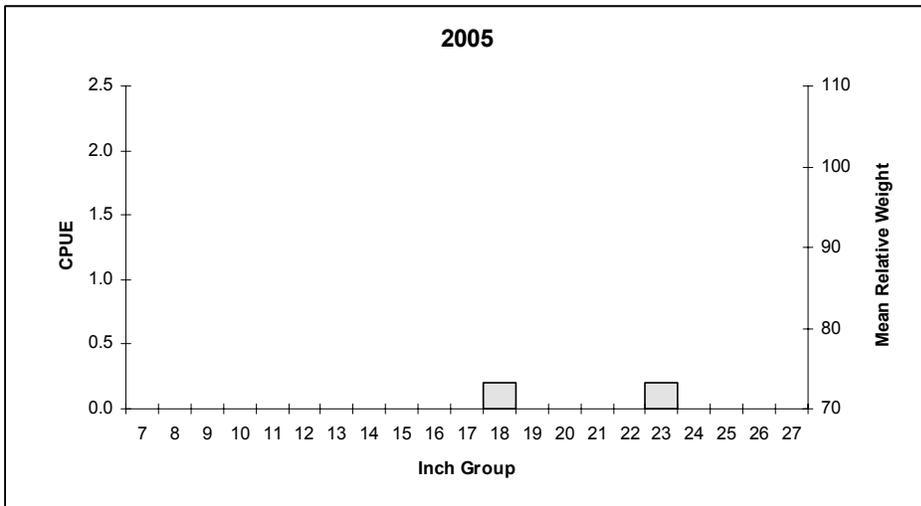
**Palmetto Bass**



Effort = 5  
 Total CPUE = 11.4  
 Stock CPUE = 11.4  
 PSD = 100  
 RSD-18 = 39



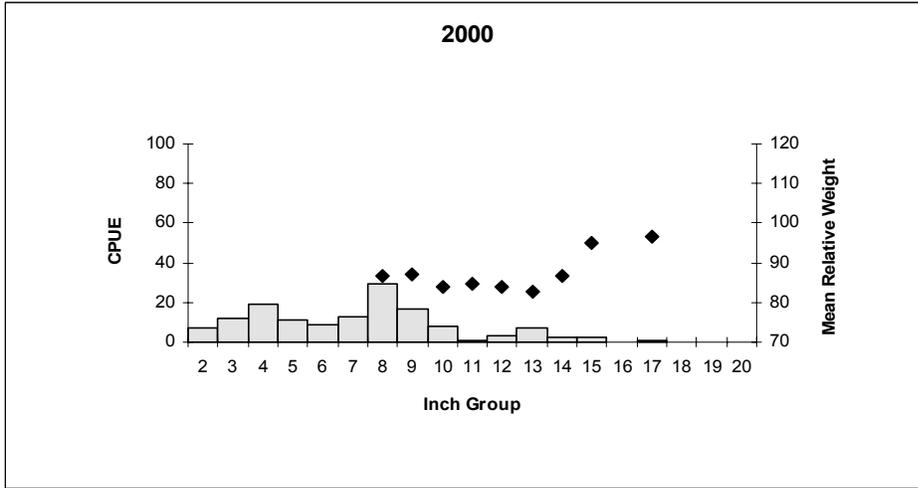
Effort = 5  
 Total CPUE = 8.2  
 Stock CPUE = 8.2  
 PSD = 95  
 RSD-18 = 39



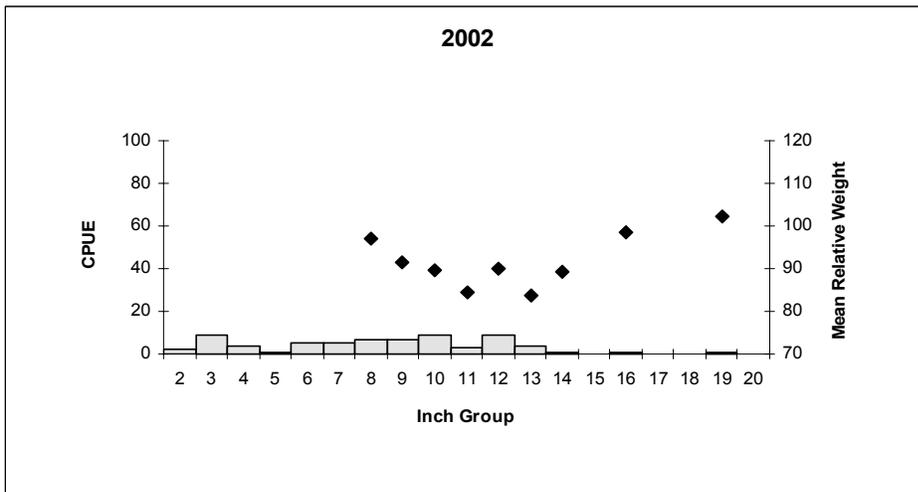
Effort = 5  
 Total CPUE = 0.4  
 Stock CPUE = 0.4  
 PSD = 100  
 RSD-18 = 100

Comparison of the number of palmetto bass caught per net night (CPUE), mean relative weight (diamonds), and population indices for spring gill net collections, Mackenzie Reservoir, Texas.

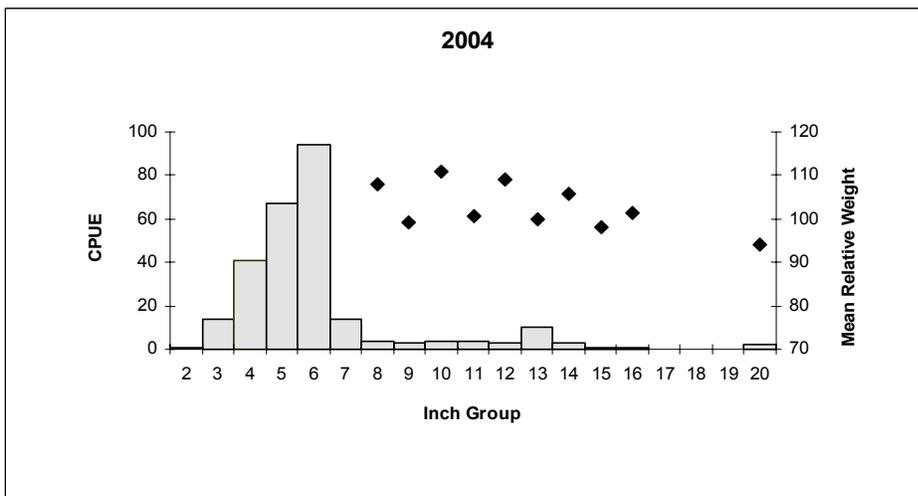
**Largemouth Bass**



Effort = 1.0  
 Total CPUE = 141.0  
 Stock CPUE = 70.0  
 PSD = 21  
 RSD-14 = 7  
 % FLMB Alleles = 23.0  
 % FLMB Genotype = 3.2



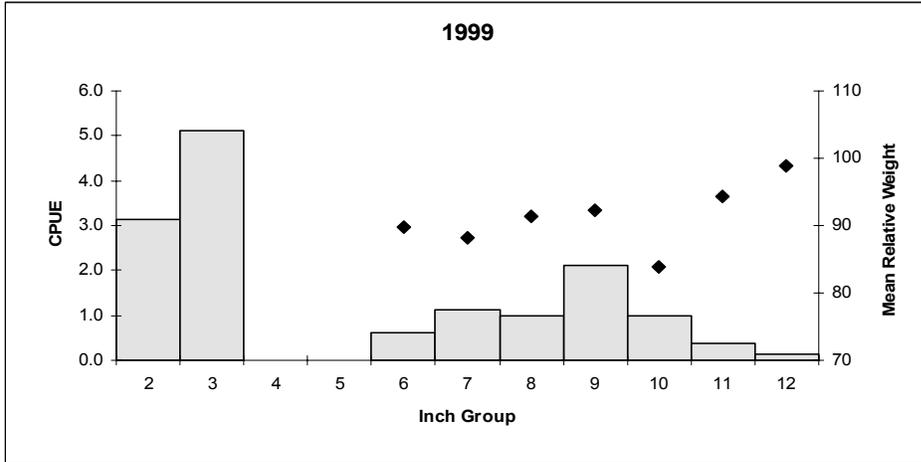
Effort = 1.0  
 Total CPUE = 68.0  
 Stock CPUE = 42.0  
 PSD = 38  
 RSD-14 = 4  
 % FLMB Alleles = NA  
 % FLMB Genotype = NA



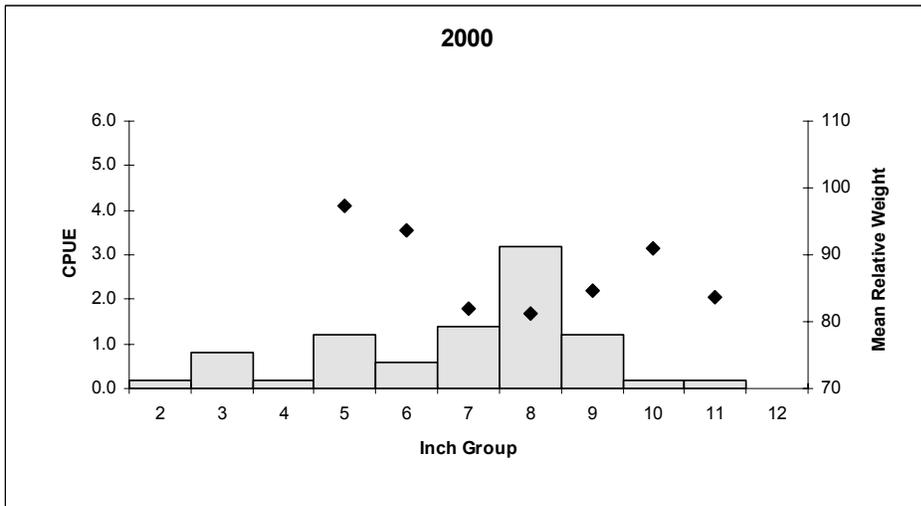
Effort = 1.0  
 Total CPUE = 266.0  
 Stock CPUE = 35.0  
 PSD = 57  
 RSD-14 = 3  
 % FLMB Alleles = 22.0  
 % FLMB Genotype = 0.0

Comparison of the number of largemouth bass caught per hour (CPUE), mean relative weight (diamonds), and population indices for fall electrofishing surveys, Mackenzie Reservoir, Texas.

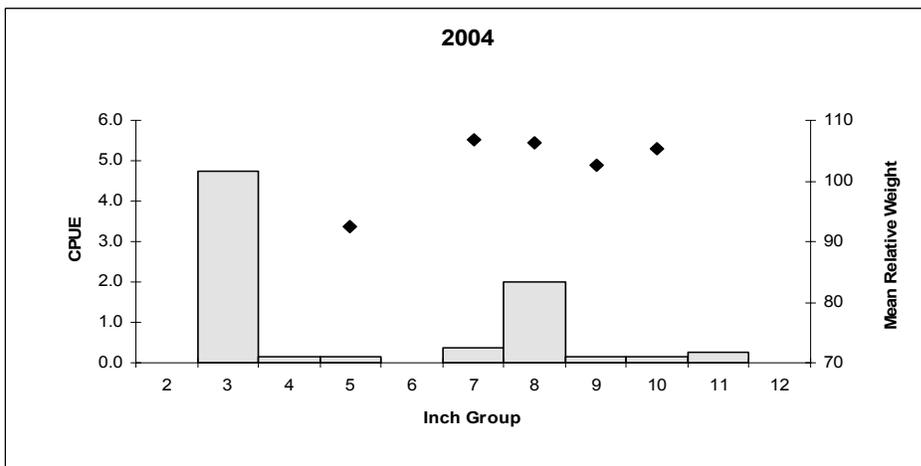
**White Crappie**



Effort = 8  
 Total CPUE = 14.6  
 Stock CPUE = 6.4  
 PSD = 73  
 RSD-10 = 24



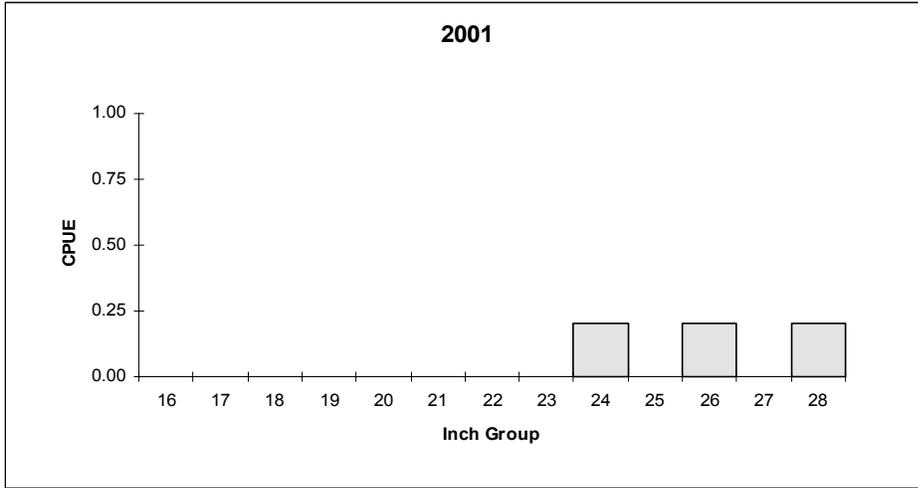
Effort = 5  
 Total CPUE = 9.2  
 Stock CPUE = 8.0  
 PSD = 60  
 RSD-10 = 5



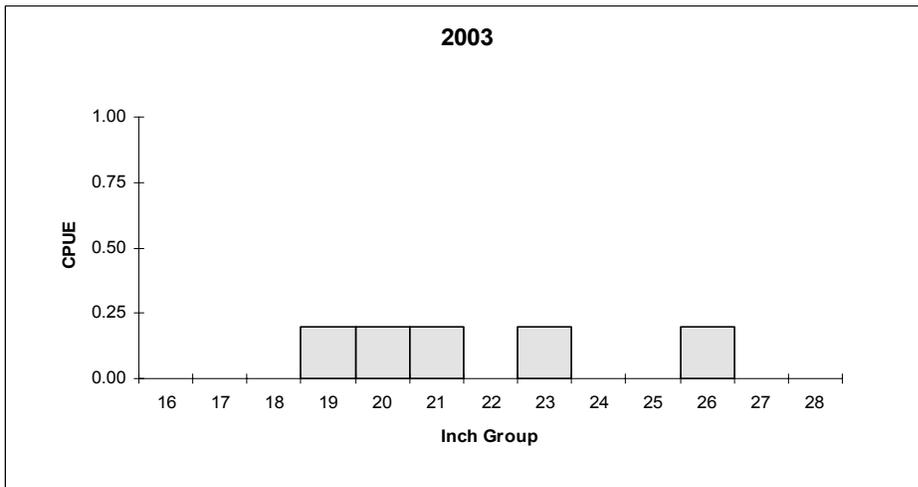
Effort = 8  
 Total CPUE = 7.9  
 Stock CPUE = 3.0  
 PSD = 83  
 RSD-10 = 5

Comparison of the number of white crappie caught per net night (CPUE), mean relative weight (diamonds), and population indices for fall trap net surveys, Mackenzie Reservoir, Texas.

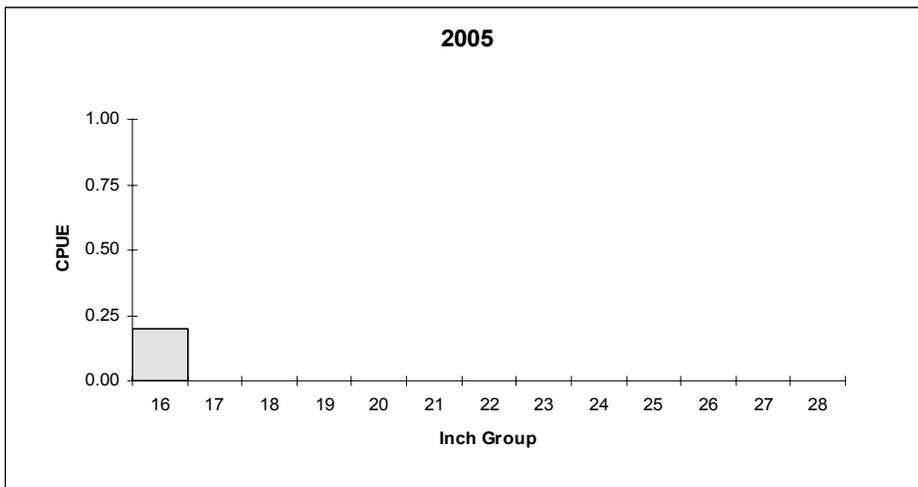
**Walleye**



Effort = 5  
 Total CPUE = 0.6  
 Stock CPUE = 0.6  
 PSD = 100  
 RSD-20 = 100



Effort = 5  
 Total CPUE = 1.0  
 Stock CPUE = 1.0  
 PSD = 100  
 RSD-20 = 80



Effort = 5  
 Total CPUE = 0.2  
 Stock CPUE = 0.2  
 PSD = 100  
 RSD-20 = 100

Comparison of the number of walleye caught per net night (CPUE), mean relative weight (diamonds), and population indices for spring gill net collections, Mackenzie Reservoir, Texas.

**Fisheries Management Plan  
Mackenzie Reservoir, Texas**

**ISSUE 1**            Although, the catch rate for the 2005 gill net survey was low, a quality palmetto bass population once existed in Mackenzie Reservoir. Low catch rates could have been a result of record low water levels during 2004.

**MANAGEMENT STRATEGIES**

1.            In an effort to maintain the quality palmetto bass fishery it is recommended that they be stocked every other year at 5-10 per acre, based upon the actual surface area of the reservoir.
2.            Add additional gillnet sampling during the 2006 sampling season to monitor the palmetto bass population, and determine if low catch rates during 2005 were due to sampling variation.

**APPENDIX A**

Table 1. Catch per unit effort (CPUE; number/h for electrofishing and number/net night for trap and gill net) of all species collected from all gear types from Mackenzie Reservoir, Texas, 2004-2005.

Species	Electrofishing 2004	Trap Net 2004	Gill Net 2005
Gizzard shad	272.0		9.2
Common carp	40.0	0.13	
Blue catfish			0.2
Channel catfish	11.0	0.13	4.4
Flathead catfish	1.0		0.4
White bass			4.4
Palmetto bass			0.4
Green sunfish	7.0		
Bluegill	59.0	0.38	0.4
Longear sunfish	27.0	0.13	
Smallmouth bass			
Largemouth bass	266.0	0.13	1.4
White crappie	1.0	7.88	11.0
Black crappie			
Walleye			0.2
Warmouth	1.0		
Logperch		0.13	

**APPENDIX B**

Table 1. Proposed sampling schedule for Mackenzie Reservoir. Trap net and electrofishing surveys are conducted in the fall, gill net surveys in the spring, and the creel is 3 months from April through June. The letter S indicates standard sampling and the letter A indicates additional sampling or reporting.

Year	Electrofishing	Trap Net	Gill Net	Creel	Report
Fall 2005 – Spring 2006			A		
Fall 2006 – Spring 2007	S		S		
Fall 2007 – Spring 2008					
Fall 2008 – Spring 2009	S	S	S	S	S

## APPENDIX C

Table 1. Estimates of fishing effort (hours) for all anglers targeting specific species or species groups. Estimates are for the period from April through June 2004. Relative standard error for the hour estimate is indicated by RSE.

Target species or species group	Percent of time seeking targeted species	Estimated hours of seeking effort/acre	RSE for hours seeking
Anything	20.36	1644.61	40
Black bass	7.15	577.60	66
Largemouth bass	15.05	1215.41	48
Crappie	1.24	99.97	136
White crappie	3.65	295.02	88
Catfish	4.62	373.22	77
Channel catfish	35.09	2833.77	35
Palmetto bass	12.83	1036.13	49

Table 2. Estimates of total pressure (hrs) and value of the fishery by quarter and for the entire survey period April through June 2004. Values indicated are US dollars. Relative standard error is indicated in parentheses.

Time Period	Total Estimated Pressure	Total Fishery Value
	2004	2004
April – June	8075.73(33)	31,119(82)

Table 3. Catch rates (fish/hour) for all anglers targeting specific species or species groups for the entire period April through June 2004. Catch rates indicated are total catch rate (CPUE) and catch rate for fish harvested (HPUE). Relative standard error (RSE) is indicated in parentheses. Dashes (--) indicate value could not be calculated.

Target species or species group	CPUE	HPUE
	2004	2004
Anything	0.233 (63)	0.171 (86)
Black bass	0.000 (---)	0.000 (---)
Largemouth bass	0.316 (52)	0.012 (125)
Crappie	0.000 (---)	0.000 (---)
White crappie	0.811 (---)	0.000 (---)
Catfish	0.000 (---)	0.000 (---)
Channel catfish	0.054 (35)	0.037 (40)
Palmetto bass	0.283 (81)	0.090 (92)

Table 4. Estimated number of fish caught, harvested, and released by species for all anglers for the survey period from April through June 2004. Released fish are categorized by length limit size groupings. Relative standard error (RSE) is indicated in parentheses. Dashes (--) indicate the value could not be calculated.

Species	Caught	Harvested	Released	Released Below	Released Above
White bass	108.20(355)	0.00(---)	108.20(355)	68.40(318)	39.80(262)
Palmetto bass	751.14(82)	176.56(100)	574.59(103)	574.59(99)	0.00(---)
Largemouth bass	1327.93(61)	13.97(238)	1313.97(62)	1194.57(63)	119.40(106)
White crappie	831.17(69)	216.79(83)	614.39(89)	614.39(86)	0.00(---)
Common carp	110.30(159)	41.90(137)	68.40(243)	0.00(---)	68.40(128)
Blue catfish	13.97(4666)	13.97(466)	0.00(---)	0.00(---)	0.00(---)
Channel catfish	533.48(57)	396.68(55)	136.80(154)	136.80(149)	0.00(---)
Flathead catfish	62.13(230)	27.93(192)	34.20(387)	34.20(371)	0.00(---)