PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-34

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

Coleman Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Coleman Reservoir were surveyed in 2008 using electrofishing and trap nets, and 2009 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:** Coleman Reservoir is a 1,783-acre impoundment owned and controlled by the City of Coleman, Texas. It was impounded in 1966 on Jim Ned Creek, a tributary of the Colorado River, and is located 11 miles north of Coleman. The reservoir provides municipal and industrial water supply for the City of Coleman and is also used for flood control and recreation. The habitat in the reservoir at the time of sampling consisted mainly of rocky structure, standing timber, and aquatic vegetation (e.g., water stargrass and floating leaf pondweed).

- **Management History:** Sport fish include channel catfish, flathead catfish, palmetto bass, largemouth bass, and white crappie. Palmetto bass have been stocked with varying frequency since 1976 with the most recent stocking in 2007. A 14-in minimum length limit was used for largemouth bass in 1985 before a 14-in minimum length limit was adopted statewide in 1986. A 16-in minimum length limit was placed on largemouth bass in 1992 but removed in 1999 in favor of the statewide 14-in minimum length limit. Age structures have been collected from palmetto bass, largemouth bass, and white crappie in past years to document growth. With the exception of largemouth bass in 1985 and from 1992-1999, statewide harvest regulations have always been used at Coleman Reservoir. Twenty-two species of aquatic plants were introduced in 1998 as part of a statewide habitat initiative.

- **Fish Community**
  - **Prey species:** Gizzard shad and bluegill comprised the main forage base for the piscivorous fish community in Coleman Reservoir. Generally, gizzard shad abundance has decreased and size has increased since 2006. Bluegill abundance has declined since 2006.

  - **Catfishes:** Relative abundance and size structure of channel catfish in 2009 remained consistent with 2003 and 2005 levels. The channel catfish population mainly consisted of legal-length (≥ 12 in) fish and the largest sampled was 23 in. Flathead catfish were also present in Coleman Reservoir.

  - **Temperate basses:** Stockings in 2007 have resulted in a high relative abundance of sub-legal palmetto bass (< 18 in). Body condition decreased from 2003 and 2005 levels. Numerous 14-16 in fish were sampled in 2009 gill nets and should reach harvestable size by 2010.

  - **Largemouth bass:** Relative abundance of largemouth bass remained steady in Coleman Reservoir. However, the size distribution was shifted slightly toward smaller fish. Additionally, body condition of largemouth bass generally decreased as size increased. The proportion of Florida-strain largemouth bass alleles was 48% in 2006.

  - **White crappie:** Abundance of white crappie has steadily increased since 2000 and size structure and body condition were similar to 2004 measurements. Fish between six and ten inches were plentiful and should result in increased abundance of legal size fish next year.

- **Management Strategies:** Continue to stock palmetto bass, when available, to supplement existing population at 5/acre. Additional electrofishing is scheduled for 2010 to further assess the largemouth bass and prey species populations.

INTRODUCTION

This document is a summary of fisheries data collected from Coleman 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

Coleman Reservoir is a 1,783-acre impoundment owned and controlled by the City of Coleman, Texas. It was impounded in 1966 on Jim Ned creek, a tributary of the Colorado River. It is located 11 miles north of Coleman. The reservoir provides municipal and industrial water supply for the City of Coleman and is also used for flood control and recreation. Coleman Reservoir is classified as mesotrophic with a mean TSI chlorophyll-*a* of 43.44 (Texas Commission on Environmental Quality 2008). Land use around the reservoir includes residential and agriculture. The habitat in the reservoir at the time of sampling consisted mainly of rocky structure, standing timber, and aquatic vegetation (e.g., water stargrass and Illinois pondweed). Water levels steadily declined after 1998 to a record low. However, this trend was reversed in July, 2002 when the reservoir filled. Coleman Reservoir has been at or close to conservation level since that time (Figure 1). Other descriptive characteristics for Coleman Reservoir are in Table 1.

Management History

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

1. Continue to stock fingerling palmetto bass at a reduced rate of 5/acre to increase forage base and decrease inter- and intraspecific competition.

   Action: Coleman Reservoir was stocked with 10,119 Palmetto bass fingerlings in 2007 (5.7/acre). Additionally, 522,122 palmetto bass fry were stocked in 2007 (293.0/acre).

Harvest regulation history: Largemouth bass were managed with a 14-in minimum length limit in 1985 before a 14-in minimum length limit was implemented statewide in 1986. Additionally, largemouth bass harvest was subject to a 16-in minimum length limit from 1992 – 1999. Other sportfishes in Coleman Reservoir have always been managed with statewide regulations (Table 2).

Stocking history: Coleman Reservoir has not been stocked since 2007 (palmetto bass). Palmetto bass stockings have occurred approximately biennially since 1976, dependent on hatchery production. Florida largemouth bass were initially stocked in Coleman Reservoir in 1991 and a supplemental stocking was used in 2001 to increase the Florida-strain influence in largemouth bass. The complete stocking history is in Table 3.

Vegetation/habitat history: Twenty-two aquatic plant species were introduced in Coleman Reservoir in 1998 as part of a statewide habitat initiative. Qualitative vegetation assessments were conducted annually by staff from the United States Army Corps of Engineers Lewisville Aquatic Ecosystem Research Facility from 1998-2007. No introduced aquatic plants were found in surveys after the reservoir filled in 2002.

METHODS

Fishes were collected by electrofishing (1.3 hours at 15, 5-min stations), trap netting (10 net nights at 10 stations), and gill netting (5 net nights at 5 stations). Electrofishing CPUE was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Gill and trap net CPUE were calculated as the

number of fish per net night (fish/nn). The genetic makeup of 30 age-0 largemouth bass was examined using microsatellite DNA analysis to determine the Florida-strain influence on the population. A random-point habitat survey was completed in 2008 to assess habitat in Coleman Reservoir. Sixty points were randomly selected from within the reservoir for habitat analysis. However, four points were inaccessible so measurements were collected from 56 points. If a randomly selected point was located off-shore, a habitat sample was taken at the randomly selected point as well as a point on the nearest bank line. All survey sites were randomly generated and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008).

Sampling statistics (CPUE for various length categories), population structure indices (proportional size distribution [PSD]), and condition indices (relative weight [W_r]) were calculated for target fishes according to Anderson and Neumann (1996) and Guy et al. (2007). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Standard error (SE) was calculated for IOV and PSD estimates

$$SE = s / \sqrt{n}$$

where s is the standard deviation of the mean and n is the sample size. Relative standard error (RSE)

$$RSE_{mean} = (SE_{mean} / mean) \times 100$$

was calculated for all CPUE statistics. Ages were determined from palmetto bass by counting annular rings on otoliths from a sub-sample of gill net sampled fish (N=36). Additionally, a von Bertalanffy growth curve was calculated for palmetto bass. Confidence intervals for habitat parameters, largemouth bass W_r, and genetic composition were determined using the percentile method based on resamples of the original data with replacement (Blank et al. 2001).

RESULTS AND DISCUSSION

Habitat: Off-shore areas were predominantly characterized by open water areas (Table 4) and near-shore habitats were primarily comprised of water stargrass, dead brush, and standing timber (Table 5). Substrate of Coleman Reservoir is a mix of rock, gravel, clay, bedrock, and sand (Table 6). Sample sites are in figure 2.

Prey species: Electrofishing CPUE was 99.2/h for gizzard shad and 175.2/h for bluegill. Gizzard shad IOV has been inconsistent since 2004 and decreased in 2008 relative to 2006. The decreased IOV of gizzard shad suggests that size structure of gizzard shad was skewed toward larger fish and a high proportion of gizzard shad were not available as forage for most sportfishes (Figure 3). The decreased IOV of gizzard shad may be attributed to inconsistent stockings of palmetto bass. A comparison of cumulative length-frequencies of gizzard shad from 1992, 1994, and 1996 samples when palmetto bass were regularly stocked compared to 2004, 2006, and 2008 samples when palmetto bass were stocked irregularly and less frequently indicated that size structure of the gizzard shad population differed between 1992-1996 and 2004-2008 (Kolmogorov-Smirnov test; D = 0.249; $P < 0.001$; Figure 4). Additionally, mean CPUE of sub-stock gizzard shad decreased from 133.3/hr in 1992-1996 to 49.7/hr in 2004-2008. Bluegill size structure has remained consistent from 2004-2008 though relative abundance decreased in 2008 compared to 2004 and 2006 (Figure 5).

Channel catfish: Gill net catch rate of channel catfish in 2009 was 2.0/nn, similar to the catch rates in 2005 (2.0/nn) and 2003 (1.0/nn) samples (Figure 6). Channel catfish size structure was consistent in 2003 (PSD = 75), 2005 (PSD = 56), and 2009 (PSD = 70). No preferred-length channel catfish (≥ 24 in) have been sampled in Coleman Reservoir since 2001.

Palmetto bass: Gill net catch rate of palmetto bass in Coleman Reservoir was 14.4/nn. The catch rate was greater than the catch rate in 2005 (10.4/nn) and 2003 (10.0/nn) (Figure 7). However, 83% of the

sampled fish were 14-16 in and were likely stocked in 2007. Ages of sampled fish ranged from two years to 14 years (Figure 8). Body condition decreased from 2003 and 2005 measurements. This can likely be attributed to a decreased available forage base, an increased number of palmetto bass, or a combination of the two. The largest palmetto bass sampled in 2009 gill nets was 25 in.

Largemouth bass: The electrofishing catch rate of stock-length largemouth bass was 70.4/h in 2008, similar to catch rates in 2006 (69.0/h) and 2004 (61.8/h). The PSD value decreased from 45 in 2006 to 31 in 2008 (Figure 9). Body condition of fish observed by length class reveals that larger fish were generally in poor condition relative to smaller fish (Table 7). Florida-strain alleles (48%) and northern-strain alleles (52%) were present in similar proportions in 2006 (Table 8).

White crappie: Trap net catch rate of white crappie was 20.4/nn in 2008, higher than in 2004 (9.6/nn) or 2000 (8.1/nn) (Figure 10). The PSD for white crappie has decreased since 2000 (PSD=89), but was similar in 2008 (PSD=52) and 2004 (PSD=45). A high abundance of 6-10 in white crappie in 2008 should provide quality angling opportunities both now and in subsequent years.

Prepared – July 2009.

ISSUE 1: Size structure of gizzard shad was skewed toward larger fish and may be attributed to inconsistent stockings of palmetto bass.

MANAGEMENT STRATEGY

1. Stocking frequency of palmetto bass has been inconsistent since 2000 because of limited production at the hatchery level. Continue to request palmetto bass stockings at 5/acre every other year to increase predation on gizzard shad and continue to provide a palmetto bass fishery.

ISSUE 2: Body condition and size structure of largemouth bass continued to decline.

MANAGEMENT STRATEGY

1. Conduct additional, fall night time electrofishing surveys to assess the largemouth bass, bluegill, and gizzard shad populations.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional monitoring in 2010/2011 and standard monitoring in 2012/2013 (Table 9). Electrofishing will be used for both additional and standard sampling and will allow assessment of the largemouth bass population and prey-fish community. Gill nets will be deployed during additional and standard sampling periods to allow further assessment of the palmetto bass population. Trap nets will be deployed in the standard sampling period to allow assessment of the white crappie population.

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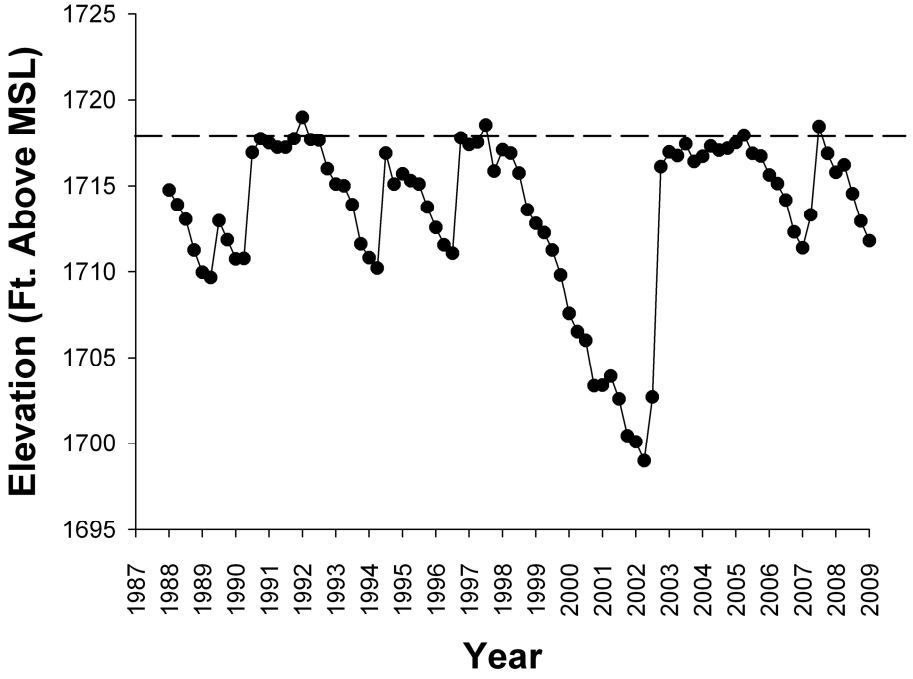


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Coleman Reservoir, Texas. Conservation level (1717.5 ft) is indicated by a horizontal dashed line.

Table 1. Characteristics of Coleman Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	City of Coleman, TX
Water uses	Municipal supply; recreation; flood control
Impoundment size	1,783 acres
County	Coleman
Geographical coordinates	32° 25' N; 99° 27' W
Reservoir type	Tributary
Watershed basin	Jim Ned Creek in the Colorado River Basin
Mean depth	10.0 ft
Maximum depth	67.0 ft
Shoreline development index (SDI)	4.05
Watershed size	292 mi^2
Secchi disc range	3-7 ft
Conductivity	550 µmhos/cm
Boat access	2 ramps
Bank access	Limited to few areas

Table 2. Harvest regulations for Coleman 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, Palmetto	5	18 – No Limit
Bass, Largemouth	5	14 – No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 – No Limit

Table 3. Stocking history in Coleman Reservoir, Texas from 1966 – 2008. Size categories are: FRY < 1 inch; FGL = 1-3 inches; ADL = adults; blank indicates size at stocking is unknown.

Species	Year	Number	Size
Threadfin shad	1984	1,950	
	1985	1,200	
	Total	3,150	
Channel catfish	1966	84,000	
	1967	350	
	2002	1,081	
	2003	33,584	FGL
	Total	119,015	
Palmetto bass	1976	21,280	
	1977	16,656	
	1979	13,950	
	1981	10,575	
	1983	9,999	
	1986	35,180	FGL
	1987	40,050	FGL
	1988	300,000	FRY
	1989	250,000	FRY
	1991	32,030	FGL
	1992	24,400	FGL
	1994	24,786	FGL
	1995	14,950	FGL
	1996	10,096	FGL
	1997	10,235	FGL
	1998	10,087	FGL

Table 3. Stocking history continued

Species	Year	Number	Size
Palmetto bass	2004	9,998	FGL
	2007	523,122	FRY
	2007	10,119	FGL
	Total	1,367,513	
Green sunfish X Redear sunfish	1966	10,000	
	1979	400	
	Total	10,400	
Largemouth bass	1966	246,000	
	1967	8,000	
	1970	100,000	
	Total	354,000	
Florida largemouth bass	1991	100,465	FGL
	2001	201,471	FGL
	Total	301,936	
Kemp's largemouth bass	1985	102,528	FGL
Black crappie	1966	2,000	

Table 4. Off-shore habitat composition at Coleman Reservoir, Texas, 2008 as measured at 44 randomly selected points. Proportions listed represent the proportion of randomly selected sites containing each habitat type. Confidence intervals were calculated at 95% using the percentile method for 1,000 resamples of the original data.

Habitat type	Proportion observed	Lower 95 %CI	Upper 95% CI
Open water	0.75	0.61	0.86
Water stargrass	0.07	0.00	0.16
Dead brush	0.11	0.02	0.23
Timber	0.14	0.05	0.25

Table 5. Near-shore habitat composition at Coleman Reservoir, Texas, 2008 as measured at 56 randomly selected points. Proportions listed represent the proportion of randomly selected sites containing each habitat type. Confidence intervals were calculated at 95% using the percentile method for 1,000 resamples of the original data.

Habitat type	Proportion observed	Lower 95% CI	Upper 95% CI
Water stargrass	0.73	0.62	0.84
Dead brush	0.39	0.27	0.52
Timber	0.16	0.07	0.27
Illinois pondweed	0.09	0.02	0.16
Brittle naiad	0.07	0.02	0.14
Water willow	0.05	0.00	0.12
Open water	0.05	0.00	0.12
Bulrush	0.04	0.00	0.09
Black willow	0.04	0.00	0.09
Lily pads	0.04	0.00	0.09
Water primrose	0.02	0.00	0.05
Sago pondweed	0.02	0.00	0.05
Coontail	0.02	0.00	0.05

Table 6. Substrate classification for near-shore habitats (N = 56) in Coleman Reservoir, Texas with proportion of each habitat type observed and 95% confidence intervals (CI) calculated from 5,000 resamples of the original data.

Habitat type	Proportion observed	Lower 95% CI	Upper 95% CI
Rock	0.64	0.52	0.75
Gravel	0.27	0.16	0.38
Clay	0.25	0.14	0.37
Bedrock	0.11	0.04	0.20
Sand	0.05	0.00	0.12

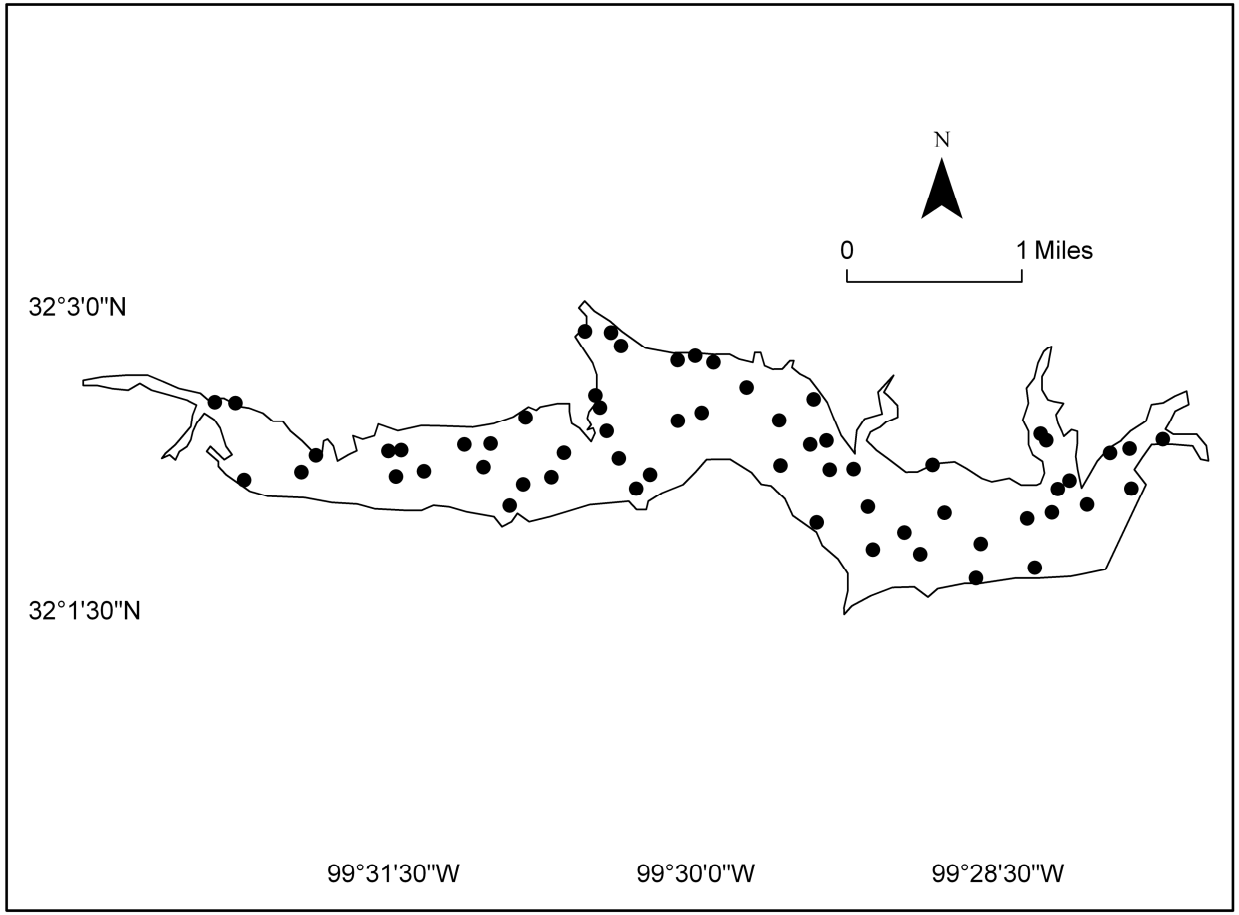
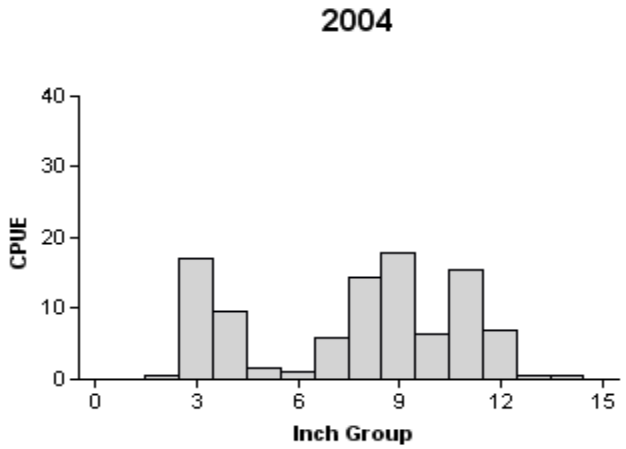
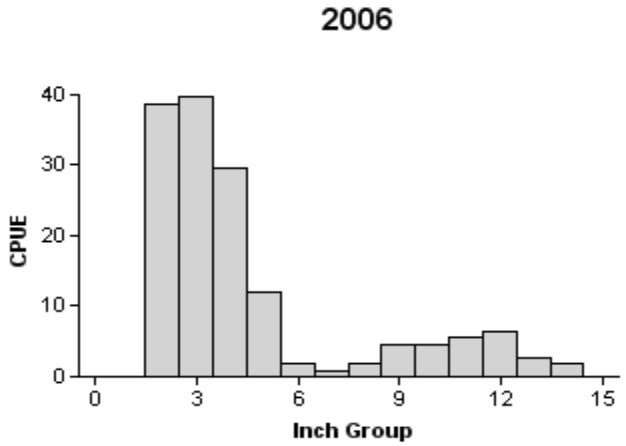


Figure 2. Habitat sampling sites at Coleman Reservoir 2008.

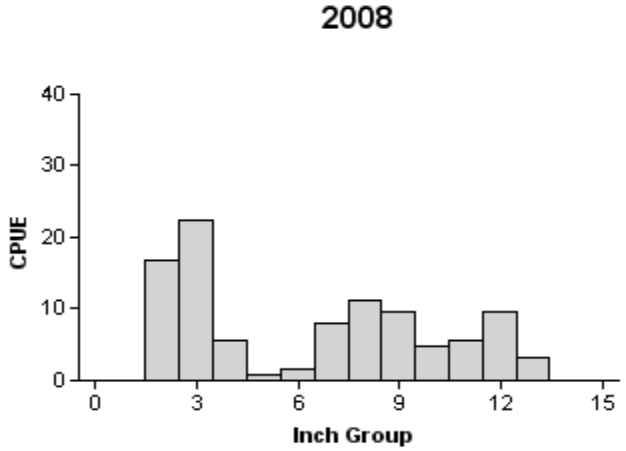
Gizzard shad



Effort =	2.0
Total CPUE =	98.0 (26; 196)
PSD =	34 (4.3)
IOV =	36.2 (3.1)



Effort =	1.1
Total CPUE =	150.5 (57; 163)
PSD =	58 (8.8)
IOV =	81.6 (7.6)



Effort =	1.3
Total CPUE =	99.2 (34; 124)
PSD =	35 (7.2)
IOV =	55.7 (16.1)

Figure 3. 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, Coleman Reservoir, Texas, 2004, 2006, and 2008.

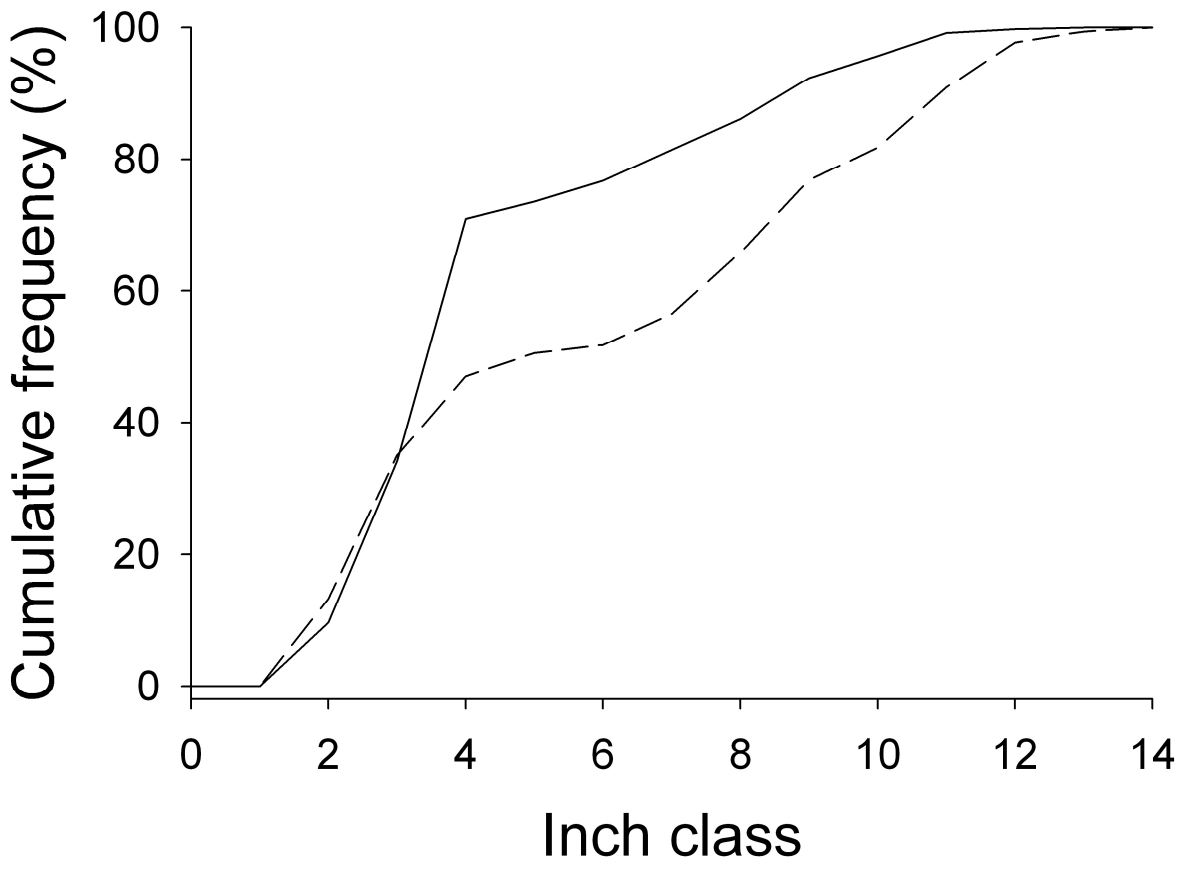
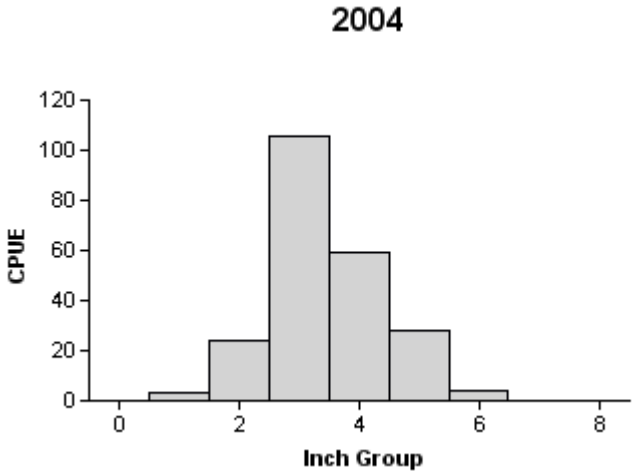
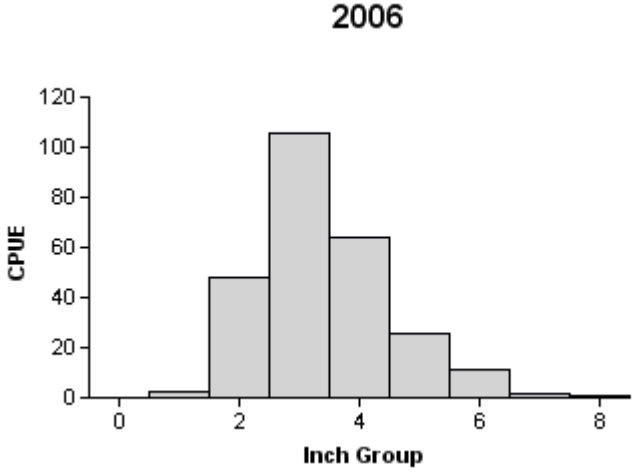


Figure 4. Cumulative frequency distribution of gizzard shad size structure in Coleman Reservoir observed from biennial sampling in 1992-1996 (solid line) and 2004-2008 (dashed line).

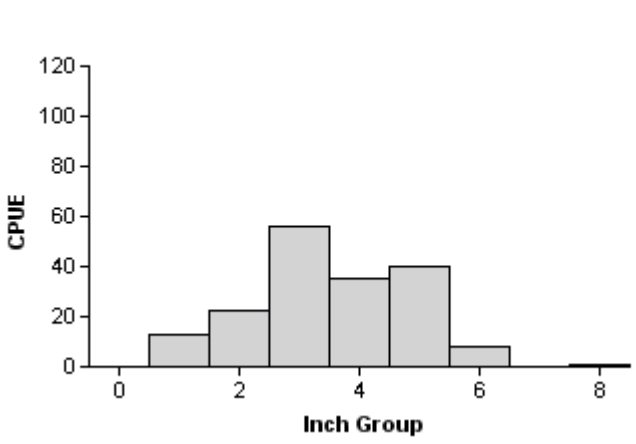
Bluegill



Effort = 2.0
Total CPUE = 224.0 (16; 448)
PSD = 2 (0.7)



Effort = 1.1
Total CPUE = 259.4 (16; 281)
PSD = 7 (2.2)



Effort = 1.3
Total CPUE = 175.2 (16; 219)
PSD = 6 (2.4)

Figure 5. 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, Coleman Reservoir, Texas, 2004, 2006, and 2008.

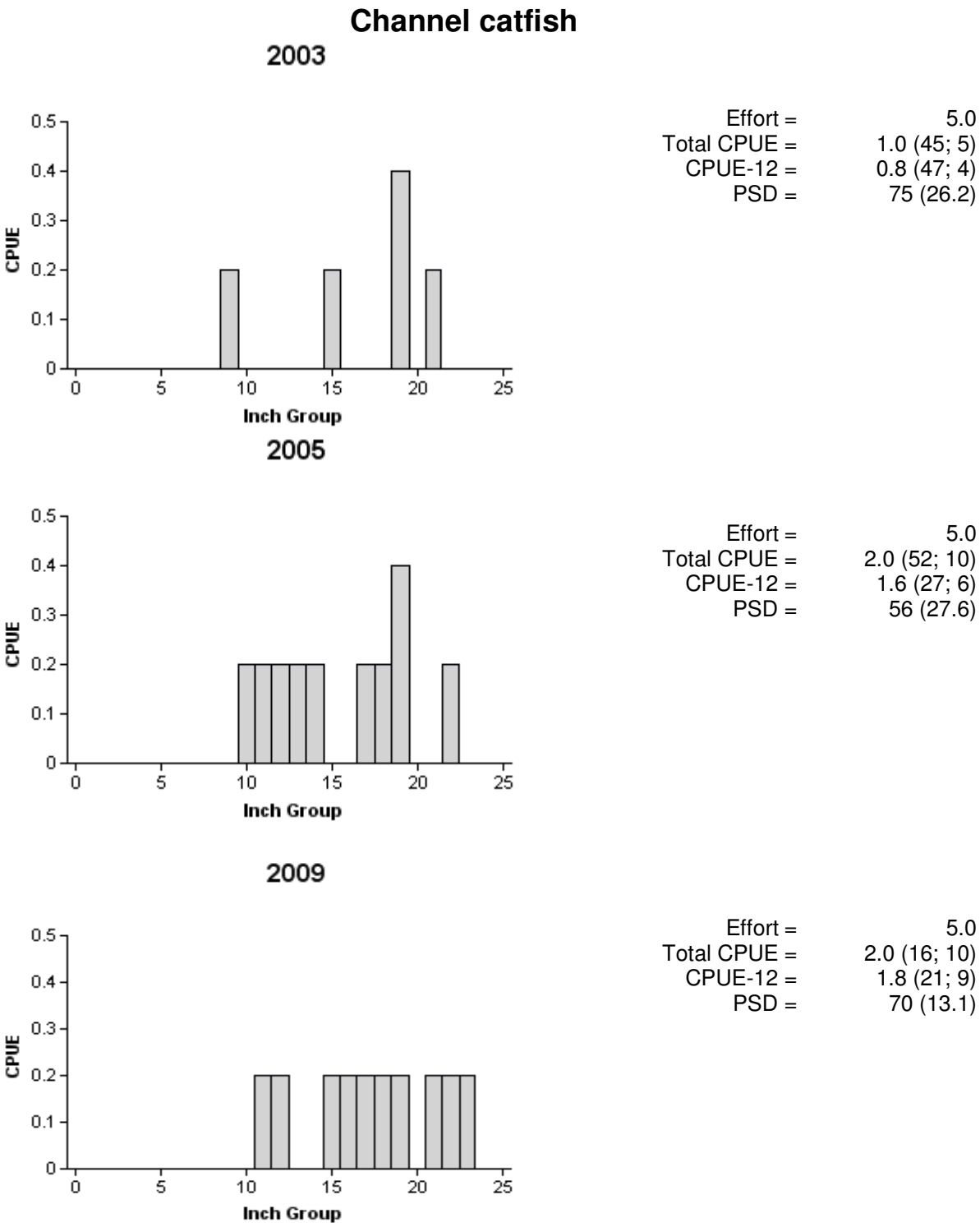
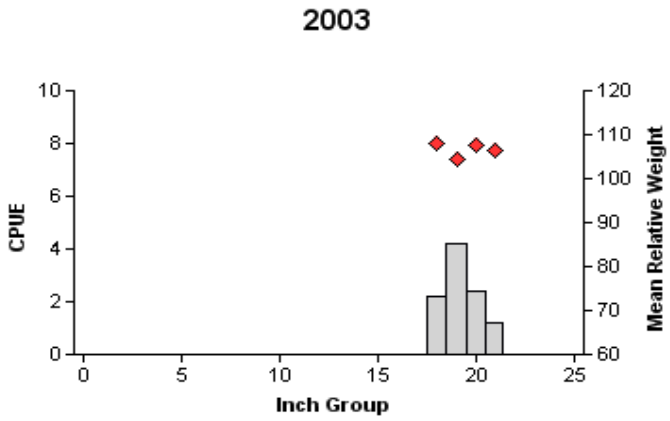
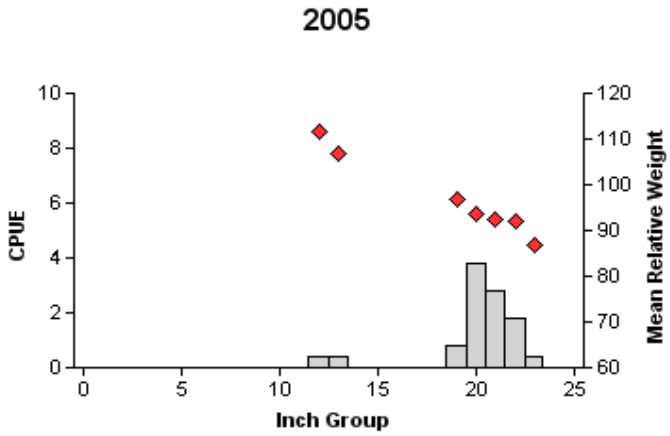


Figure 6. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Coleman Reservoir, Texas, 2003, 2005, and 2009.

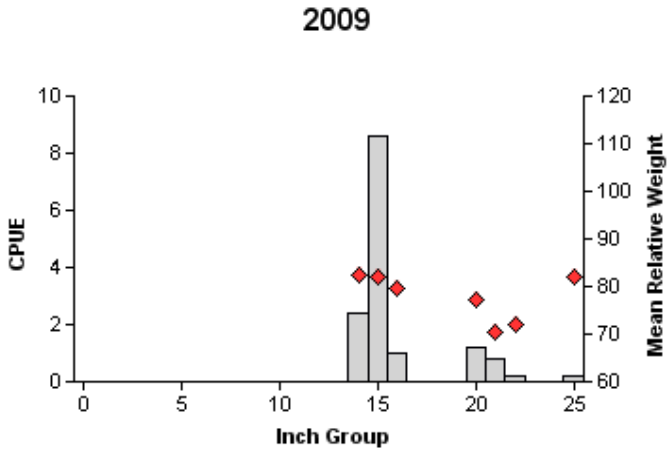
Palmetto bass



Effort =	5.0
Total CPUE =	10.0 (58; 50)
CPUE-18 =	10.0 (58; 50)
PSD =	100 (0)
PSD-M =	36 (12.6)



Effort =	5.0
Total CPUE =	10.4 (44; 52)
CPUE-18 =	9.6 (43; 48)
PSD =	100 (0)
PSD-M =	85 (5.2)



Effort =	5.0
Total CPUE =	14.4 (51; 72)
CPUE-18 =	2.4 (60; 12)
PSD =	100 (0)
PSD-M =	17 (11.9)

Figure 7. Number of palmetto bass 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, Coleman Reservoir, Texas, 2003, 2005, and 2009.

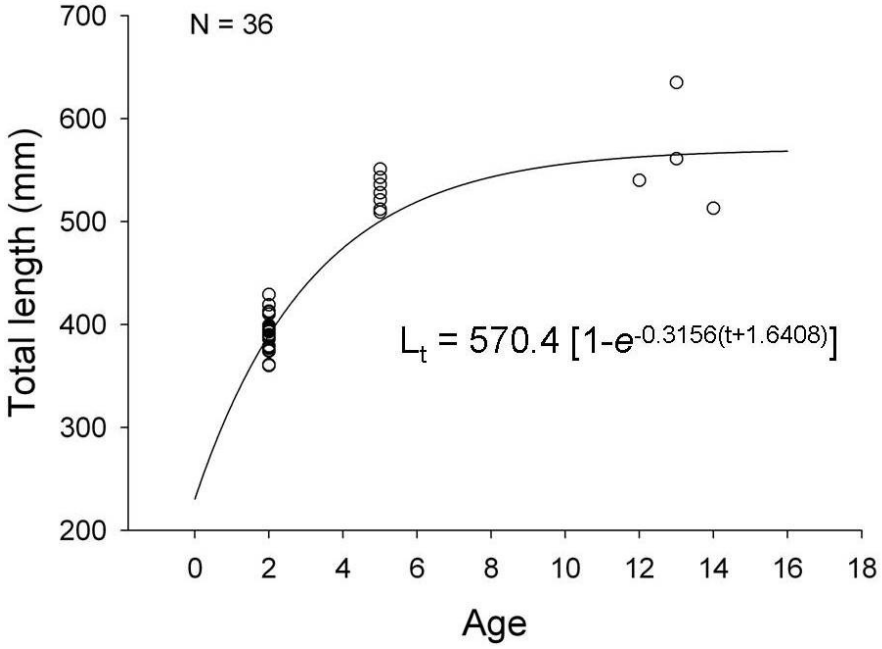
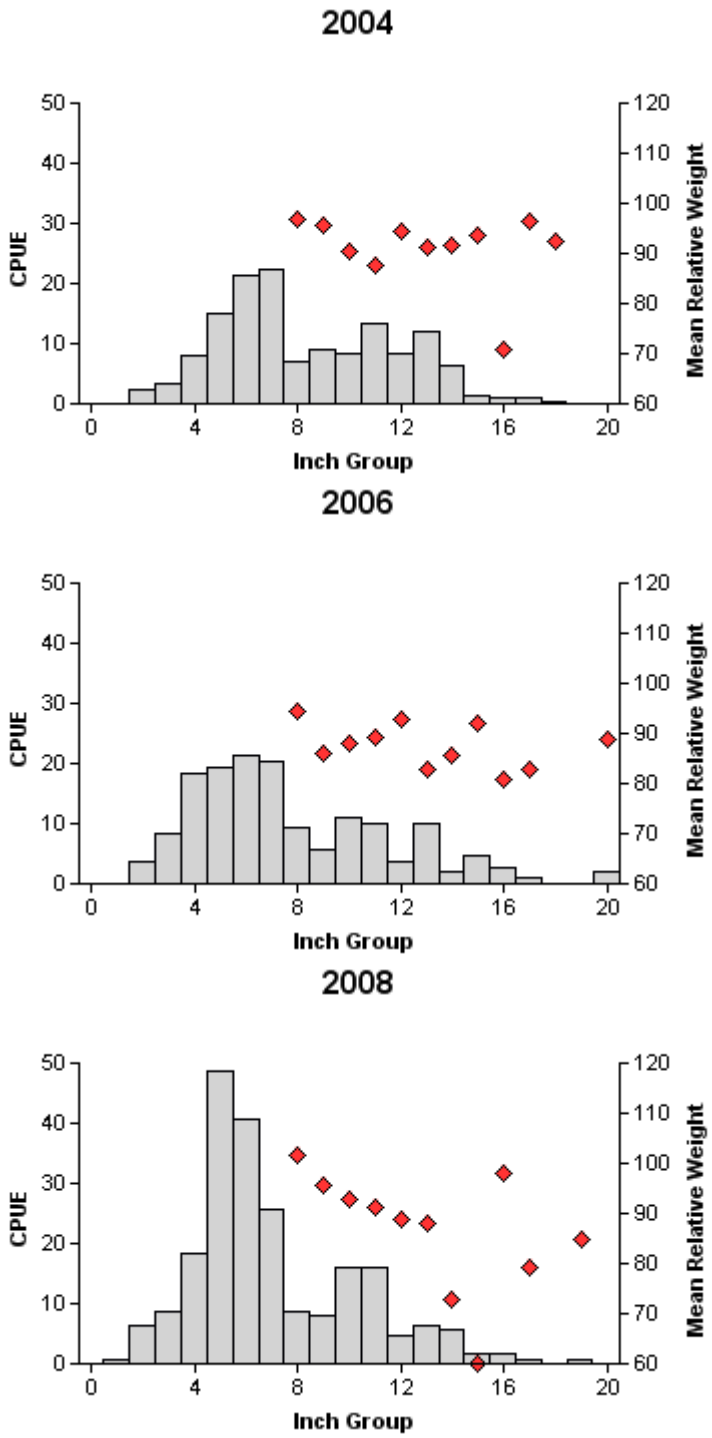


Figure 8. Length at age for 2009 gill net sampled palmetto bass and the von Bertalanffy growth curve equation.

Largemouth bass



Effort =	1.1
Total CPUE =	153.2 (25; 166)
Stock CPUE =	61.8 (19; 678)
PSD =	42 (6.1)
PSD-P =	16 (4.3)

Effort =	2.0
Total CPUE =	142.0 (20; 284)
Stock CPUE =	69.0 (22; 138)
PSD =	45 (5.4)
PSD-P =	6 (1.7)

Effort =	1.3
Total CPUE =	220.0 (15; 275)
Stock CPUE =	70.4 (25; 88)
PSD =	31 (4.6)
PSD-P =	7 (3.1)

Figure 9. 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, Coleman Reservoir, Texas, 2004, 2006, and 2008.

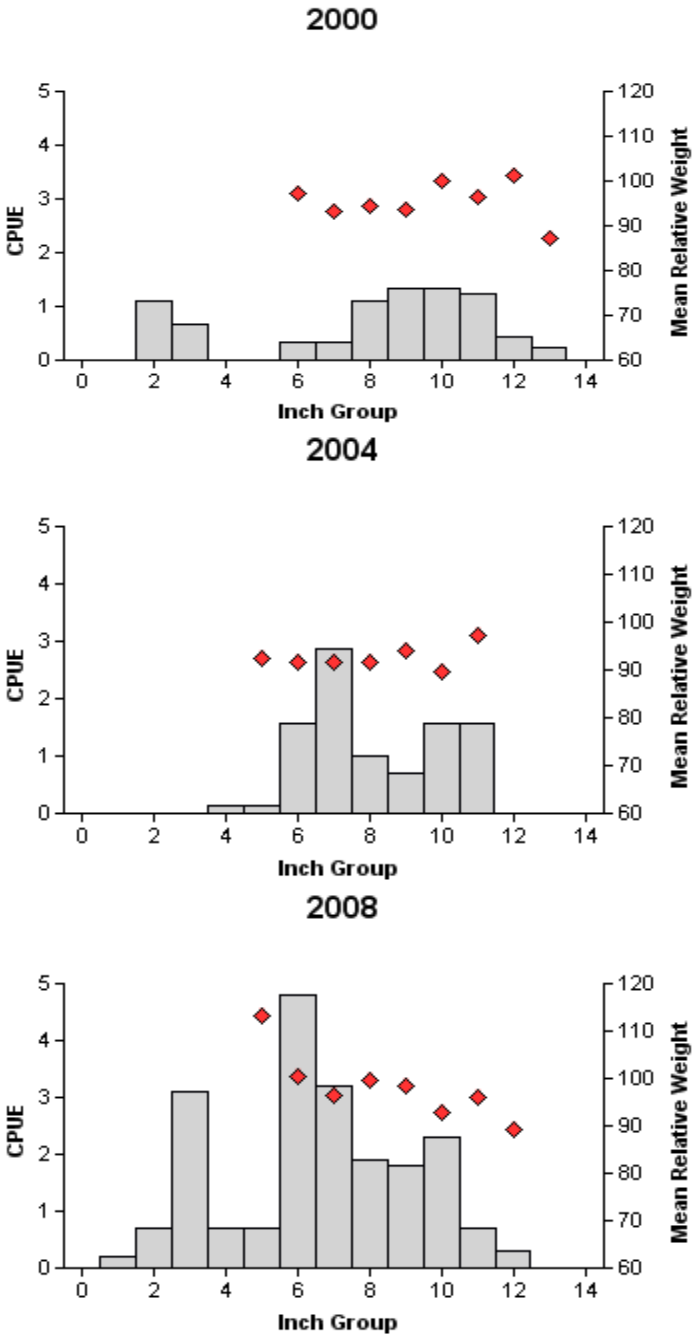
Table 7. Relative weight (W_r) of largemouth bass by length group in Coleman Reservoir, Texas 2008. Length groups are defined as stock to quality (S – Q; ≥ 8 in and < 12 in), quality to preferred (Q – P; ≥ 12 in and < 15 in), and greater than preferred (≥ P; ≥ 15 in). Confidence intervals (95% CI) were calculated from 1,000 resamples of the original data.

Length group	N	Mean W_r	Lower 95% CI	Upper 95% CI
S – Q	61	94	92	96
Q – P	20	85	82	88
≥ P	6	80	66	93

Table 8. Genetic composition of the largemouth bass population in Coleman Reservoir, Texas in 2006 with 95% confidence intervals (CI) calculated from 5,000 resamples of the original data. Genetic composition was analyzed from 30 age-0 largemouth bass.

Genetic measurement	Proportion	Lower 95% CI	Upper 95% CI
Northern-strain alleles	0.52	0.45	0.59
Florida-strain alleles	0.48	0.42	0.55
Northern-strain genotypes	0.00	0.00	0.00
Florida-strain genotypes	0.00	0.00	0.00
Florida-strain X Northern-strain hybrids	1.00	1.00	1.00

White crappie



Effort =	9.0
Total CPUE =	8.1 (32; 73)
Stock CPUE =	6.3 (43; 57)
CPUE-10 =	3.2 (50; 29)
PSD =	89 (9.8)
PSD-P =	51(7.0)

Effort =	7.0
Total CPUE =	9.6 (64; 67)
Stock CPUE =	9.4 (63; 66)
CPUE-10 =	3.1 (42; 22)
PSD =	52 (7.8)
PSD-P =	33 (9.7)

Effort =	10.0
Total CPUE =	20.4 (27; 204)
Stock CPUE =	15.7 (29; 157)
CPUE-10 =	3.3 (38; 33)
PSD =	45 (10)
PSD-P =	21 (5.8)

Figure 10. 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, Coleman Reservoir, Texas, 2000, 2004, and 2008.

Table 9. Proposed sampling schedule for Coleman Reservoir, Texas. Hoop net surveys are completed in summer, electrofishing and trap net surveys are conducted in fall, and gill net surveys occur in spring. Standard surveys are denoted by S and additional surveys are denoted with A.

Survey year	Electrofish	Trap net	Hoop net	Gill net	Report
Summer 2009 – Spring 2010					
Summer 2010 – Spring 2011	A			A	
Summer 2011 – Spring 2012					
Summer 2012 – Spring 2013	S	S	A	S	S

APPENDIX A

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

Species	Electrofishing		Trap netting		Gill netting	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	124	99.2				
Threadfin shad	36	28.8				
Channel catfish			1	0.1	10	2.00
Flathead catfish					4	0.8
Palmetto bass					72	14.4
Green sunfish	31	24.8				
Warmouth	25	20.0				
Orangespotted sunfish			1	0.1		
Bluegill	219	175.2				
Longear sunfish	55	44.0				
Redear sunfish	31	24.8	1	0.1		
Largemouth bass	275	220.0				
White crappie			204	20.4		
Black crappie			1	0.1		

APPENDIX B

Location of sampling sites, Coleman Reservoir, Texas, 2008/2009. Locations of electrofishing sites (E), trap netting sites (T), and gill netting sites (G) are indicated on the map. Water level was within seven feet of full pool at time of sampling.