

PERFORMANCE REPORT

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STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

Clyde Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Clyde Reservoir was surveyed in 2008 with hoop nets, electrofishing, and trap nets, and 2009 with gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Clyde reservoir is a 374-acre impoundment of Pecan Bayou created in 1970. It is located 15 miles southeast of Abilene and is controlled by the City of Clyde. Primary water uses for Clyde Reservoir are municipal water supply and recreation. Shoreline habitat in Clyde Reservoir consisted of dead brush, black willow, button brush, and salt cedar in 2008. Severe drought conditions from 1998-2004 reduced the water level in the reservoir, but the reservoir filled to within four feet of conservation pool in late 2004 and remained stable through 2007. Water level has dropped steadily since 2007 and is presently estimated at 10 feet below conservation pool. Boat access consists of two public-use ramps, and bank fishing is available in several areas.
- **Management History:** Clyde Reservoir has been a quality largemouth bass fishery in past years. The current lake record is 14.8 pounds and was caught 2001. Florida largemouth bass were stocked in 2004 and 2005 to help re-establish Clyde Reservoir as a quality largemouth bass fishery following severe drought conditions. Channel catfish were stocked in 2004 to supplement the existing population and replace fish lost during drought conditions.
- **Fish Community**
 - **Prey species:** Gizzard shad and bluegill comprised the main forage base for predators. Catch rates of gizzard shad remained high with greater than 83% of the population available to predatory fish. Bluegill abundance has steadily increased since the lake filled.
 - **Catfishes:** All sampled blue catfish were greater than 18 in and the channel catfish population was dominated by 8- to 15-inch fish. Several flathead catfish up to 25 inches were sampled.
 - **Largemouth bass:** Largemouth bass size structure has remained consistent since 2004 and several fish greater than 18 inches have been observed in recent surveys. Largemouth bass were generally in good body condition. Proportion of Florida-strain influenced bass was high and implies that recent stockings were successful.
 - **White crappie:** Abundance and size structure of white crappie have improved since 2004. High numbers of age-0 white crappie were observed suggesting a successful year class and the potential for increased abundance of legal-size fish within three years.
- **Management Strategies:** Monitor white crappie and largemouth bass populations and advertise to angling community when crappie reach harvestable size and bass reach trophy size. Continue to monitor the blue catfish population and supplement with stockings if necessary. Additional electrofishing and trap net surveys are scheduled for 2010 to further assess the fish community.

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INTRODUCTION

This document is a summary of fisheries data collected from Clyde 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

Clyde Reservoir is a 374-acre impoundment located on Pecan Bayou in the Colorado River Basin approximately 15 miles southeast of Abilene. It was constructed in 1970 as a municipal water supply and is controlled by the City of Clyde, Texas. Watershed land use is primarily agriculture. Water level history is not kept for this reservoir; however, during winter 2000/2001, the reservoir size was estimated at less than 50 surface acres due to a severe ongoing drought. By the end of 2004, water level was within four feet of conservation level and remained stable through 2007. Water level has dropped steadily since 2007. By early 2009, water level was estimated 10 feet below conservation pool. The habitat consisted primarily of clay or sand flats, gravel or rock banks, and submerged terrestrial vegetation. Clyde Reservoir became a limited-entry fishery in 2008 when a pay-gate was installed at the only entrance. Other characteristics of Clyde Reservoir are listed 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. Monitor the success of 2004 and 2005 stockings of Florida largemouth bass with genetic analyses.
Action: Microsatellite DNA samples were analyzed for 30 age-0 largemouth bass in 2006. Florida influence was observed in 71% of genetic samples suggesting that post-drought stockings of Florida-strain largemouth bass were successful.
2. Monitor Clyde Reservoir and its fishery to evaluate recovery from drought conditions.
Action: Electrofishing and trap net surveys were conducted in fall 2008 to assess gizzard shad, bluegill, largemouth bass, and white crappie populations. Hoop net surveys were implemented in summer 2008, and gill net surveys were used in spring 2009 to assess channel and blue catfish populations. A habitat survey was conducted in 2008.
3. Stock appropriate fish species as determined by monitoring efforts.
Action: Stockings of Florida largemouth bass in 2004 and 2005 contributed to the genetic structure of the largemouth bass population in Clyde Reservoir. Additionally, channel catfish fingerlings were stocked in 2004. No additional stockings were needed to supplement the fish community.

Harvest regulation history: Sportfishes in Clyde Reservoir have always been managed with statewide regulations (Table 2).

Stocking history: Clyde Reservoir has not been stocked since 2005 (Florida largemouth bass). Channel catfish and Florida largemouth were stocked in 2004 and blue catfish were stocked in 1997 and 1998. The complete stocking history is in Table 3.

Vegetation/habitat history: Clyde Reservoir has no vegetation/habitat management history.

METHODS

Fishes were collected by hoop netting (three units of effort where each unit of effort was defined as a series of three hoop nets in tandem fished for three nights), electrofishing (1 hour at 12 5-min stations),

trap netting (10 net nights at 10 stations), and gill netting (5 net nights at 5 stations). Catch per unit effort (CPUE) for hoop nets was determined as the number of fish per hoop net series fished for three nights (fish/series). Electrofishing CPUE was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Gill and trap net CPUE was calculated as the number of fish per net night (fish/nn). Microsatellite DNA analysis was used in 2006 to determine genetic makeup of 30 age-0 largemouth bass. A random-point habitat survey was completed in 2008 to assess physical habitat in Clyde Reservoir. Forty-two points were randomly selected from within the reservoir for habitat analysis. 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 selected 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), structural 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). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for IOV. Confidence intervals 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 and dead brush. Near-shore habitats were primarily comprised of inundated dead brush (Table 4). Substrate of Clyde Reservoir is a mix of rock, gravel, sand, and clay (Table 5).

Prey species: Electrofishing CPUE was 485.0/h for gizzard shad and 323.0/h for bluegill. Gizzard shad IOV has ranged from 80-99 between 2004 and 2008 suggesting that a high proportion of gizzard shad were available as forage to predatory fish (Figure 1). Bluegill size structure has remained consistent from 2004-2008 and relative abundance has increased (Figure 2).

Blue catfish: Blue catfish were sampled in gill nets for the first time in Clyde Reservoir in spring 2009. Gill net CPUE for blue catfish was 1.8/nn. Approximately 50,000 fingerling blue catfish were stocked in both 1997 and 1998 (Table 3) and these fish likely constituted most or all of the blue catfish in trap net surveys from 2000. All gill net sampled fish in 2009 were greater than 18 inches and the largest was 30 inches (Figure 3). Ages of three 18-20 inch blue catfish were estimated at 5-6 years by counting annular rings on sectioned pectoral fin rays. These ages suggest that reproduction occurred within the populations that were stocked in 1997 and 1998. No juvenile blue catfish were sampled from Clyde Reservoir in gill nets in 2009.

Channel catfish: The hoop net catch rate of channel catfish in 2008 was 20.7/series. Size structure of channel catfish collected in hoop nets consisted primarily of 10- to 15-inch fish with 76% of the sampled fish available for harvest (Figure 4). Catch rate of channel catfish in gill nets was 3.8/nn. Gill nets primarily collected 8- to 15-inch fish (Figure 5). Catch rates were lower in 2009 surveys than in 1997 surveys though more harvestable fish were sampled in 2009 (Figure 5).

Largemouth bass: The electrofishing catch rate of stock-length largemouth bass was 61.0/h in 2008, greater than 33.3/h in 2006 and 14.4/h in 2004. Mean PSD values decreased from 58 in 2004 to 39 in 2008 (Figure 6). The decreased PSD value reflects an increased abundance of 8-12 in largemouth bass. Mean $W_r > 90$ was observed for nearly all inch groups of fish and was similar to body condition in previous surveys (Figure 6). Additionally, body condition of largemouth bass was consistent among length groups in 2008 (Table 6). The genetic structure of the largemouth bass population was analyzed in 2006; Florida alleles were 71% and Florida genotype was 7% (Table 7). Florida alleles were increased from measurements in 1992 (58%), 1994 (49%), and 1997 (51%).

White crappie: Trap net catch rate of white crappie was 37.4/nn in 2008, higher than in 2004 (6.3/nn) (Figure 7). The PSD was 20 in 2008 and was much less than the PSD in 2004 (88) (Figure 7). The size structure of white crappie in 2008 differed from 2004, although several fish above 10 inches were sampled in 2008. Numerous white crappie from three – six inches were collected, suggesting a strong year class.

Fisheries management plan for Clyde Reservoir, Texas

Prepared – July 2009.

ISSUE 1: White crappie abundance and size structure is improving following the drought of 1998-2004. A strong year class in 2008 should result in increased abundance of harvestable fish in 2010 and 2011.

MANAGEMENT STRATEGY

1. Advertise white crappie fishing to anglers by promoting the 2008 year class when they reach harvestable size.

ISSUE 2: Largemouth bass have historically grown to large sizes in Clyde Reservoir and offered anglers trophy fishing opportunities. Following the drought of 1998-2004, Florida largemouth bass were stocked in Clyde Reservoir and the genetic makeup of the population has become conducive to production of larger fish.

MANAGEMENT STRATEGY

1. Continue to monitor largemouth bass population and promote the fishery when largemouth bass begin to reach trophy size.
2. Analyze the genetics of the largemouth bass population with microsatellite DNA samples in 2010.
3. Conduct daytime spring electrofishing survey in 2010 to assess trophy-size largemouth bass.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional monitoring in 2010-2011 and standard monitoring in 2012-2013 (Table 8). Electrofishing will be used for both additional and standard sampling and will allow assessment of the largemouth bass population and prey-fish community. Additionally, largemouth bass needed for DNA analyses will be collected using electrofishing in 2010. Trap net surveys will be conducted during both additional and standard sampling periods to allow assessment of the white crappie population. Gill net surveys will be used during standard sampling to allow further assessment of the blue catfish and channel catfish population. Hoop net surveys will also be used during standard sampling to assess the channel catfish population.

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Table 1. Characteristics of Clyde Reservoir, Texas.

Characteristic	Description
Year constructed	1970
Controlling authority	City of Clyde, TX
Water uses	Municipal supply; recreation
Impoundment size	374 acres
County	Callahan
Geographical coordinates	32° 28' N; 99° 17' W
Reservoir type	Mainstem
Watershed basin	Pecan Bayou in the Colorado River Basin
Mean depth	10.0 ft
Maximum depth	30.0 ft
Shoreline development index (SDI)	2.3
Watershed size	38 mi ²
Secchi disc range	1 ft
Conductivity	610 µmhos/cm
Boat access	2 ramps; adequate
Bank access	2 areas; adequate

Table 2. Current harvest regulations for sportfishes in Clyde 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, 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 Clyde Reservoir, Texas from 1976 - 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	1,000	
	1990	2,343	
	1991	2,812	ADL
	Total	6,155	
Blue catfish	1980	6,800	
	1997	50,800	FGL
	1998	50,839	FGL
	Total	108,349	
Channel catfish	1980	12,000	
	1981	28,015	
	1991	12,548	FGL
	2004	21,957	FGL
	Total	74,520	
Largemouth bass	1976	10,000	
Florida largemouth bass	1979	2,500	FGL
	1988	50,784	FGL
	1997	50,428	FGL
	2004	45,277	FGL
	2005	45,398	FGL
	Total	194,387	
Walleye	1979	900,000	

Table 4. Macrohabitat composition of Clyde Reservoir, Texas from 2008 with proportions of observed habitat types and 95% confidence intervals calculated from 5,000 resamples of the original data.

Hab. type	N	Open	Dead brush	Black Willow	Button Brush	Salt Cedar
Off-shore	30	0.70 (0.53–0.87)	0.30 (0.13-0.47)	0.03 (0.00-0.13)	0.00 (0.00)	0.00 (0.00)
Near-shore	42	0.07 (0.00-0.17)	0.93 (0.83-1.00)	0.21 (0.09-0.33)	0.10 (0.02-0.19)	0.02 (0.00-0.07)

Table 5. Substrate classification for near-shore habitats (N = 42) in Clyde 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	Obs. proportion	Lower 95% CI	Upper 95% CI
Rock	0.45	0.31	0.62
Sand	0.48	0.33	0.64
Clay	0.36	0.21	0.50
Gravel	0.33	0.19	0.48
Clay only	0.21	0.09	0.33
Gravel and/or rock only	0.26	0.17	0.43

Gizzard shad

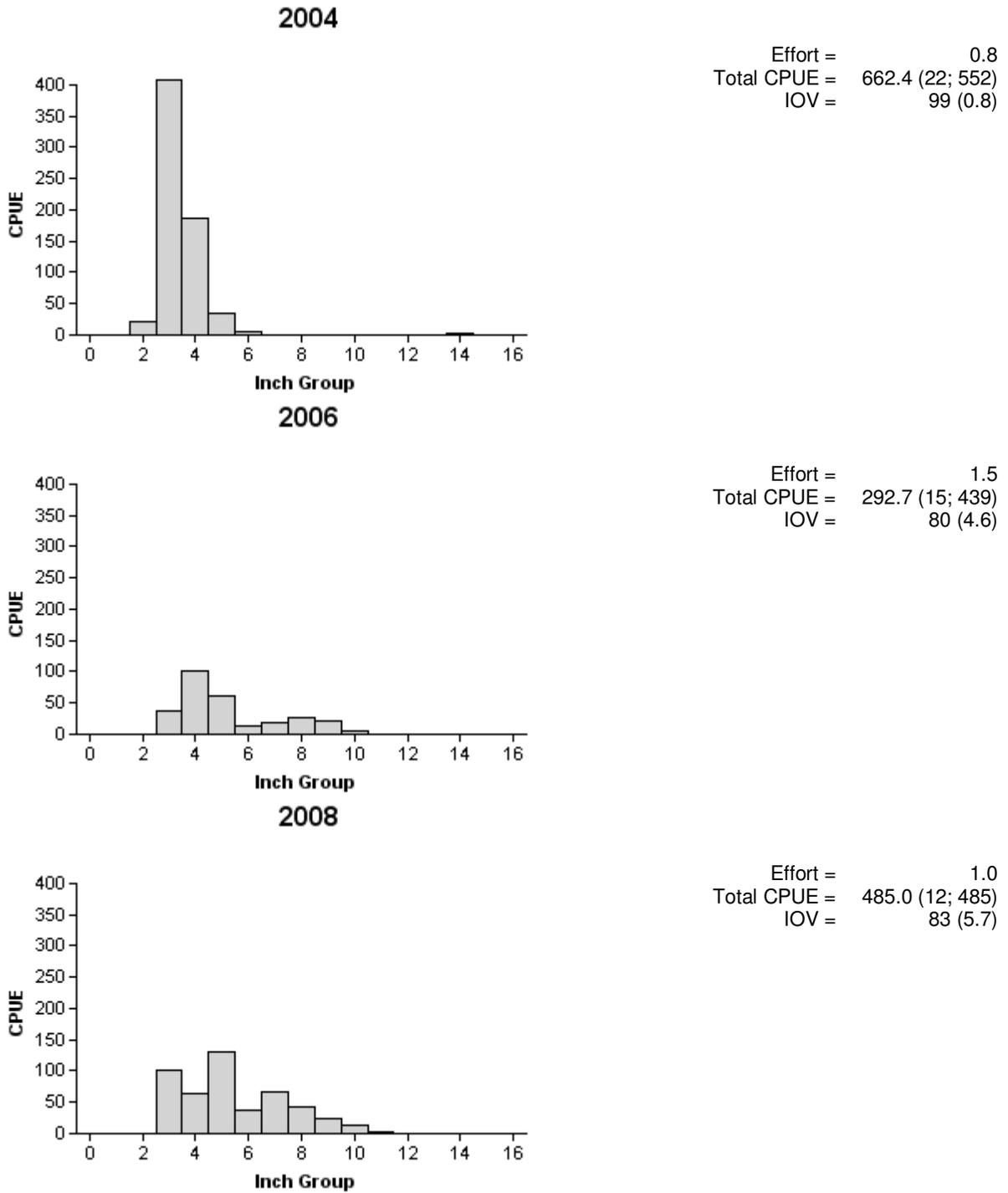
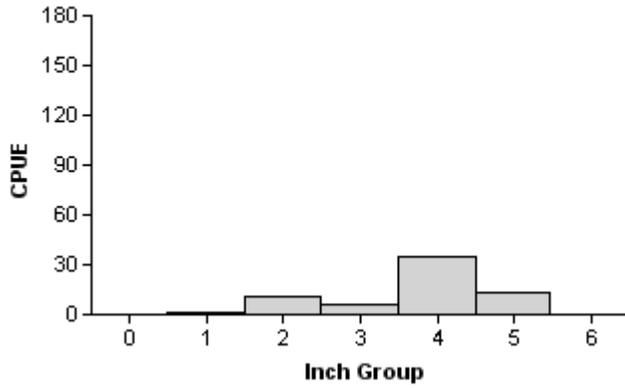


Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Clyde Reservoir, Texas, 2004, 2006, and 2008.

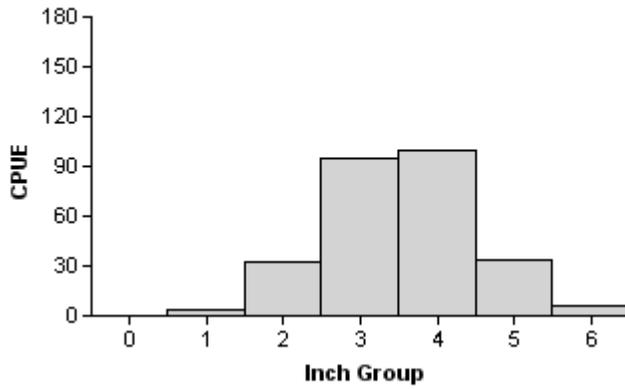
Bluegill

2004



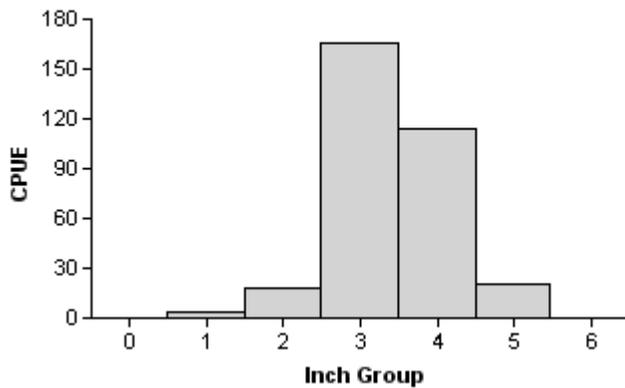
Effort = 0.8
 Total CPUE = 66.0 (22; 55)
 PSD = 0 (0)

2006



Effort = 1.5
 Total CPUE = 270.0 (22; 405)
 PSD = 3 (1.3)

2008



Effort = 1.0
 Total CPUE = 323.0 (25; 323)
 PSD = 0 (0)

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, Clyde Reservoir, Texas, 2004, 2006, and 2008.

Blue catfish

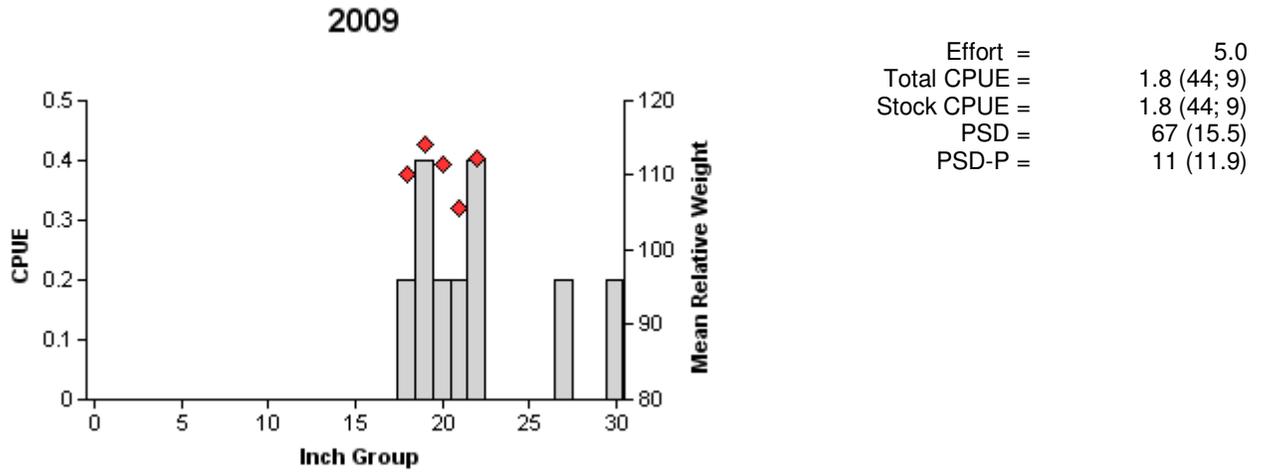
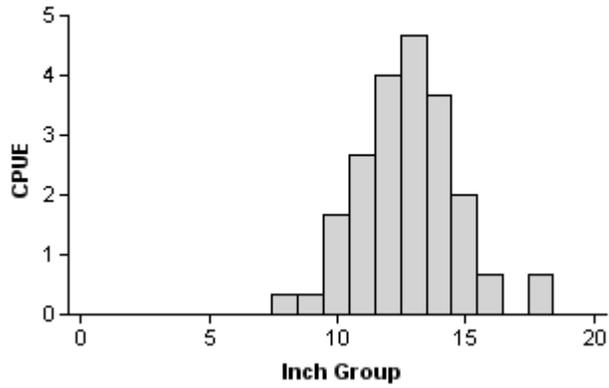


Figure 3. Number of blue catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Clyde Reservoir, Texas, 2009.

Channel catfish**2008**

Effort = 3.0
Total CPUE = 20.7 (32; 62)
PSD = 7 (4.9)

Figure 4. Number of channel catfish caught per hoop net series (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for summer hoop net surveys, Clyde Reservoir, Texas, 2008.

Channel catfish

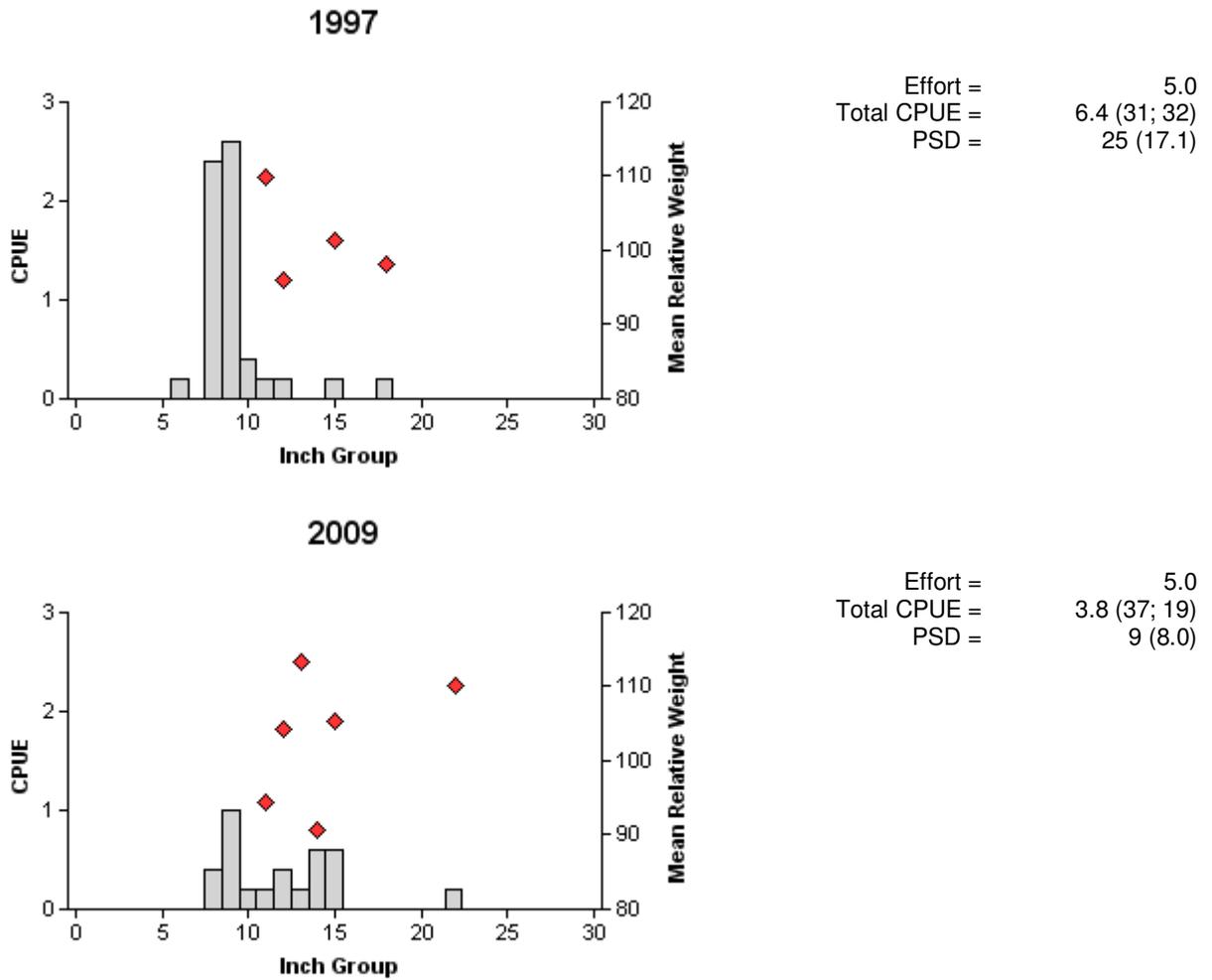


Figure 5. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Clyde Reservoir, Texas, 1997 and 2009.

Largemouth bass

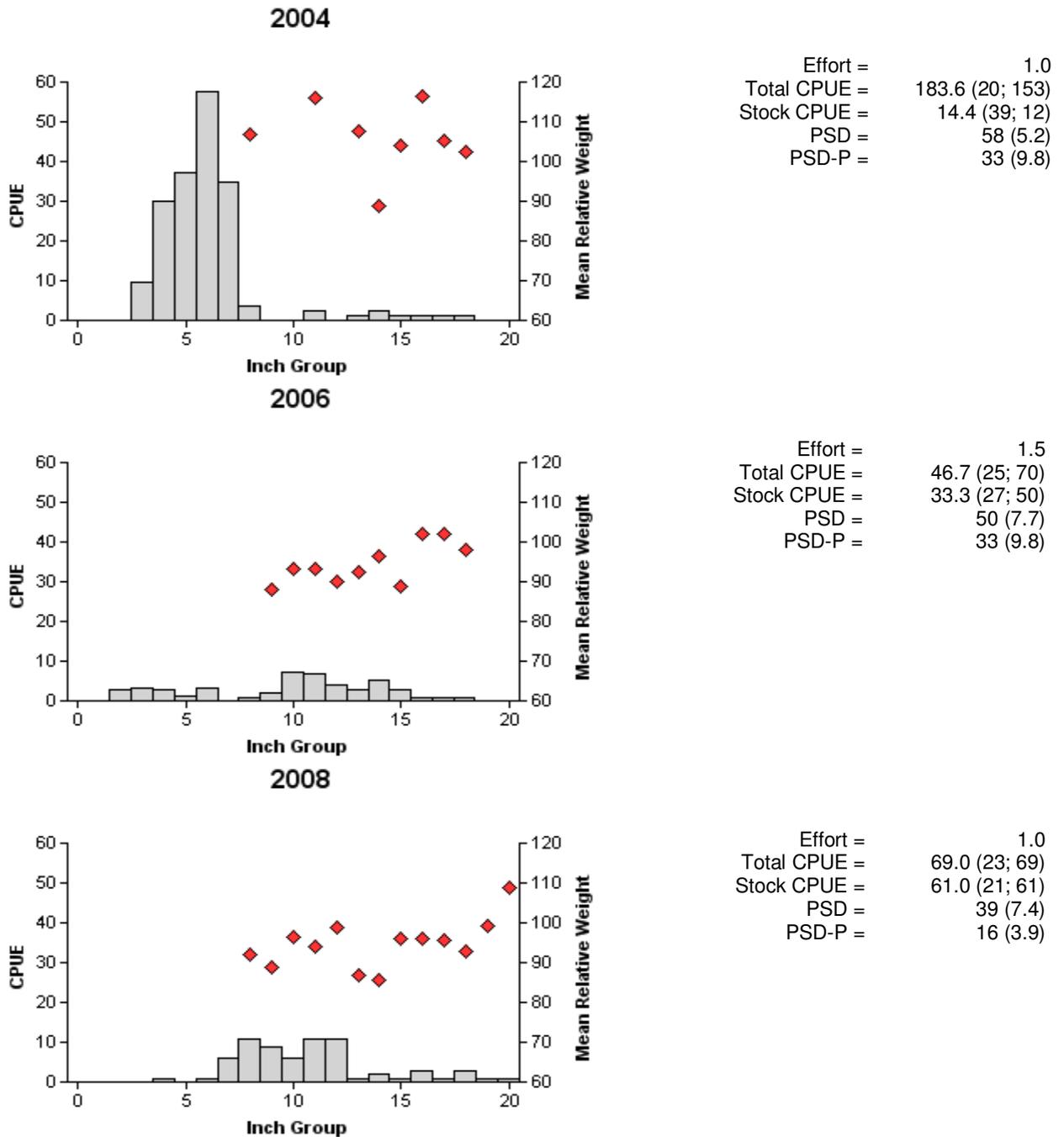


Figure 6. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Clyde Reservoir, Texas, 2004, 2006, and 2008.

Table 6. Relative weight (W_r) of largemouth bass by length group in Clyde 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 ($\geq P$; ≥ 15 in) and 95% confidence intervals (CI) were calculated from 1,000 resamples of the original data.

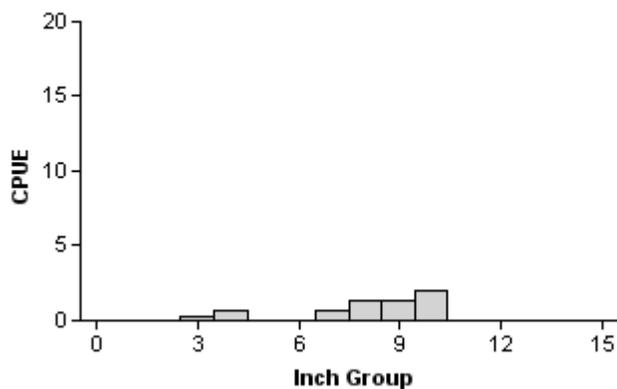
Length group	N	Mean W_r	Lower 95% CI	Upper 95% CI
S – Q	36	92	89	95
Q – P	14	95	90	100
$\geq P$	10	96	92	100

Table 7. Genetic composition of the largemouth bass population in Clyde Reservoir, Texas in 2006 with 95% confidence intervals (CI) calculated from 5,000 resamples of the original data. Sample taken from 30 age-0 largemouth bass.

Genetic measurement	Proportion	Lower 95% CI	Upper 95% CI
Northern-strain alleles	0.29	0.23	0.35
Florida-strain alleles	0.71	0.65	0.77
Northern-strain genotypes	0.00	0.00	0.00
Florida-strain genotypes	0.07	0.00	0.17
Florida-strain X Northern-strain hybrids	0.93	0.83	1.00

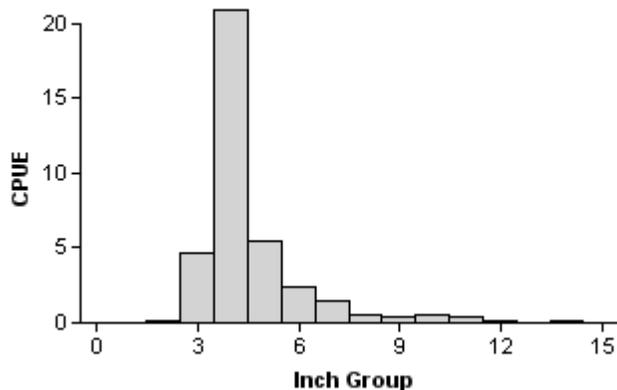
White crappie

2004



Effort =	3.0
Total CPUE =	6.3 (92; 19)
Stock CPUE =	5.3 (100; 16)
PSD =	88 (0.6)
PSD-P =	38 (0.6)

2008



Effort =	10.0
Total CPUE =	37.4 (38; 374)
Stock CPUE =	11.7 (18; 117)
PSD =	20 (6.2)
PSD-P =	11 (4.7)

Figure 7. Number of white crappie caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Clyde Reservoir, Texas, 2000, 2004, and 2008.

Table 8. Proposed sampling schedule for Clyde 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	Electrofishing	Trap net	Hoop net	Gill net	Report
Summer 2009 – Spring 2010	A*				
Summer 2010 – Spring 2011		A			
Summer 2011 – Spring 2012					
Summer 2012 – Spring 2013	S	S	A	S	S

*Spring daytime

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APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear in Clyde Reservoir, Texas, 2008/2009.

Species	Electrofishing		Trap netting		Hoop netting		Gill netting	
	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	485	485.0						
Blue catfish							9	1.8
Channel catfish					62	20.7	19	4.0
Flathead catfish							3	0.6
Green sunfish	16	16.0						
Warmouth	11	11.0						
Bluegill	323	323.0						
Longear sunfish	32	32.0						
Largemouth bass	69	69.0						
White Crappie			374	37.4				

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APPENDIX B

Location of sampling sites, Clyde Reservoir, Texas, 2008/2009. Locations of electrofishing sites (E), trap netting sites (T), hoop netting sites (H), and gill netting sites (G) are indicated on the map. Water level was within 10 ft of conservation pool at time of sampling.

