PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-33

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2007 Survey Report

Ray Roberts Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Ray Roberts Reservoir were surveyed in 2007 using an electrofisher and trap nets and in 2008 using gill nets. Habitat was last surveyed in 2003. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Ray Roberts Reservoir is a 25,600-acre impoundment on the Elm Fork Trinity River north of Dallas-Fort Worth in Denton, Grayson, and Cooke Counties. Water level was below conservation elevation (632.5 feet-mean sea level) from May 2005 to May 2007. Ray Roberts Reservoir has moderate productivity. Habitat features consisted mainly of flooded dead timber, rocky shoreline, dead trees and stumps, native submergent vegetation, and riprap along the dam and railroad bridges.

- **Management history:** Important sport fish included blue and channel catfish, white bass, largemouth bass and white crappie. The management plan from 2003 included supplemental electrofishing, a 36-day creel survey/attitude and opinion survey, angler non-compliance verification, water quality history review, and web page update. Adult threadfin shad were stocked in 1985. Channel catfish were stocked in 1986. Florida largemouth bass fingerlings were stocked in 1985, 1987, 1989, 1993, 1994, 2000, and 2001. In 1987, 78 adult Florida largemouth bass were stocked. In 1987 coppernose bluegill fingerlings were stocked. Statewide fish harvest regulations apply to all sport fishes in Ray Roberts Reservoir with the exception of largemouth bass. For largemouth bass, length limit is a 14- to 24-inch slot. Largemouth bass 14 inches and less or 24 inches or greater in length may be retained. Only one largemouth bass 24 inches or greater may be retained each day.

- **Fish community**

  - **Prey species:** Threadfin shad continued to be present in the reservoir and showed a significant increase in abundance. Electrofishing catch of gizzard shad increased since 2003. Nearly 80% of the gizzard shad were available as prey. Electrofishing catch of desirable prey-size bluegills was high, but there were also good numbers of angler harvestable-size bluegills.
  - **Catfishes:** Gill net catch of blue catfish was high with well over one-half of the sampled population being legal size and in good condition. Angler harvest was very low. Recruitment was evident. Gill net catch of channel catfish dropped below the previous survey, but still high and they were in good condition. Angler harvest was good with some noncompliance. Flathead catfish were present in the reservoir; two were collected.
  - **White bass:** Gill net catch of white bass was good with well over one-half the sample catch was legal size and larger. Angler harvest was good. White bass were in fair to good condition; intermediate to small fish had better body condition compared to larger fish.
  - **Black basses:** Abundance of spotted bass has increased since 2003 with larger fish in good condition. Numbers of largemouth bass almost tripled since 2003, with excellent recruitment and good body condition. Due to high water levels in 2007. Angler harvest of spotted and largemouth was low. Florida largemouth bass alleles were high.
  - **White crappie:** Abundance and body condition of white crappie were very good. One third of the sample population was legal size and larger. Angler harvest was excellent.

- **Management strategies:** Implement statewide 14-inch minimum length limit for largemouth bass, 5 fish daily bag limit, September 1, 2009. Conduct creel survey in the fall of 2009 and spring of 2010. Conduct general monitoring with electrofisher, trap nets, and gill nets in 2011-2012. Conduct habitat/vegetation survey in 2011.

INTRODUCTION

This document is a summary of fisheries data collected from Ray Roberts Reservoir in 2007-2008. 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 are presented with the 2007-2008 data for comparison.

Reservoir Description

Ray Roberts Reservoir is a 25,600-acre impoundment on the Elm Fork Trinity River north of Dallas-Fort Worth in Denton, Grayson, and Cooke Counties. It was constructed in 1987 by the U.S. Army Corps of Engineers for municipal water supply, flood control and recreation. Ray Roberts Reservoir was mesotrophic with a mean TSI chl-*a* of 45.88 (Texas Commission on Environmental Quality 2008). Habitat at time of sampling consisted of rocky shoreline, dead trees, and riprap. There were isolated patches of native and non-native submerged vegetation. Native aquatic plants present were pondweed, water willow, and buttonbush. Non-native was Eurasian milfoil and hydrilla. Water level has been low and unstable since April 2004 (Figure 1). Public access consisted of eight public access areas, seven of which offered boat ramps, and angler access at eight bridge crossings. Pecan Creek Park access area off of FM3002 on the Elm Fork Trinity River arm is the only boat ramp and access area on the reservoir offering free access, all others charge $5.00 per person or $60.00 annual fee. Further information about Ray Roberts Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Department (TPWD) web site at www.tpwd.state.tx.us and navigating within the fishing link. Other descriptive characteristics for Ray Roberts Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Hysmith and Moczygemba 2004) included:

1. Recommended supplemental electrofishing surveys in the fall of 2004 and spring of 2005. Use historical subjective sample sites that have produced big bass or augment random sampling with subjective sample sites.
   Action: Electrofishing surveys (4.0 hours) were conducted in the fall of 2004 and spring of 2005 (6.3 hours). Sites were selected that produced big bass in past surveys. Total CPUE in the fall of 2004 was 88.7 bass per hour with an RSD-18 of 4. During the spring of 2005 total CPUE was 38.8 bass per hour, with an RSD-18 of 14.
2. Due to apparent declining recreational angling effort on Ray Roberts Reservoir, a supplemental creel and attitude/opinion survey was recommended from June 2004 through May 2005.
   Action: A roving 36-day creel survey was conducted and showed that total fishing effort was 312,511 hours. Most of the direct angling effort remained focused on largemouth bass and the catch rate was 0.34/h and harvest rate of largemouth bass was 0.30/acre. Of the 371 attitude and opinion surveys distributed via mail to consenting anglers who were interviewed on the lake, 251 responded (Bradle et al. 2005). Most anglers (87%) were moderately satisfied to extremely satisfied with overall fishing at Ray Roberts Reservoir, 67% were moderately satisfied to extremely satisfied with the current 14- to 24-inch slot length limit, and 75% were moderately to extremely satisfied with the State‘s management of largemouth bass at Ray Roberts Reservoir.
3. In response to suspicion of angler non-compliance during creel surveys conducted 1998 through 2001; we recommended having law enforcement review our report.

Action: Law enforcement personnel in Fort Worth confirmed evidence of angler non-compliance in catches of channel catfish, largemouth bass, and white crappie. Increased game warden presence netted several arrests for under-sized sport fish.

4. In response to perceived decline in fish production, we recommended researching U.S. Geological Survey, Texas Commission on Environmental Quality, University of North Texas, and U.S. Army Corps of Engineers water quality data bases for potential problems.
   Action: Researched the above mentioned data bases in search of water quality parameters which might compromise primary productivity; hence, fish production. There were no obvious indicators of water quality problems.
5. We recommended communicating recreational angling opportunities to our constituents.
   Action: Updated the Ray Roberts Reservoir web page on the TPWD web site.

Harvest regulation history: Sportfishes in Ray Roberts Reservoir are currently managed with statewide regulations with the exception of largemouth bass; for largemouth bass, length limit is a 14- to 24-inch slot. Largemouth bass 14 inches and less or 24 inches or greater in length may be retained. Only one largemouth bass 24 inches or greater may be retained each day (Table 2); implemented September 1, 1998.

Stocking history: Ray Roberts Reservoir was last stocked in 2005 with 14,839 Florida largemouth bass fingerlings resulting from the spawn of a ShareLunker. Other stockings included 2000 and 2001 with Florida largemouth bass at 20/acre. Stocking in both years was concentrated in approximately 5,000 acres (20% of the reservoir) of bay created by Isle du Bois and Buck Creeks rather than the traditional reservoir-wide distribution of fingerlings. The targeted area was bounded on the south by the opening into the bay from the main body of Ray Roberts Reservoir upstream to the FM922 Bridge across Isle du Bois Creek and upstream to the US377 Bridge across Buck Creek. Florida largemouth bass fry were first stocked into Ray Roberts Reservoir in 1985 at 2.3/ acre. This same year 1,200 adult threadfin shad were stocked. Fifty thousand advanced fingerling channel catfish were stocked in 1986 and advanced fingerling and fry coppernose bluegill were stocked in 1987(advanced fingerlings at 9/acre) and again in 1987 with fry at 4/acre. A complete stocking history is included in Table 3.

Vegetation/habitat history: Flooding in 2007 precluded a habitat assessment; therefore, we used data from the 2003 survey (Table 4). Historically flooded timber (dead trees and stumps) provided the bulk of habitat in Ray Roberts Reservoir (Table 4; Hysmith and Moczygemba 2004). Native and non-native submerged vegetation occupied some 2,200 acres. A portion of this included hydrilla, which continued to decline in abundance, and Eurasian water milfoil, which increased with the decline of hydrilla.

METHODS

Fishes were collected by electrofishing (2 hours at 24 5-min stations), gill netting (15 net nights at 15 stations), and trap netting (15 net nights at 15 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill and trap nets, as the number of fish caught per net night (fish/nn). Survey sites were randomly selected. All surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2006).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] 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. Ages for channel and blue catfish, white bass, largemouth bass, and white crappie were determined using Category 2 protocol according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2006). The manual specifies procedures for age-and-growth analysis for largemouth bass, but we adapted the protocol to include channel and blue catfish and white crappie.

Tissue samples from 30 age-0 largemouth bass were collected, preserved, and transported for electrophoretic analysis according to Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2006).

A creel survey was conducted over a 12-month period from June, 2004 to May, 2005. Interviews were conducted on 5 weekend days and 4 weekdays per quarter, to assess angler use and fish catch/harvest rate in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004). Names and addresses of consenting anglers were obtained to participate in an attitude and opinion survey. Survey forms were later mailed-out (Bradle et al 2005).

RESULTS AND DISCUSSION

Habitat: Habitat features consisted mainly of rocky shoreline, dead trees and stumps, native submergent vegetation, and riprap along the dam and railroad bridges (Table 4). Standing dead timber was the major habitat feature. Due to flooding in 2007, we used data from the 2003 survey. Water level experienced minor fluctuations from March 2001 to March 2006 (Figure 1). Drought conditions existed September 1999 through September 2000 and again August 2006 to June 2007.

Prey species: Electrofishing CPUE of gizzard shad and bluegill were 145.0/h and 208.0/h, respectively (Figures 2 and 3). The gizzard shad population was much improved since 2003. Overall abundance increased, but more importantly, IOV almost tripled from 25% in 2003 to 80% (Figure 2). Gizzard shad consistently provided a good prey base since 1988 (Appendix D). Threadfin shad were more abundant; with a current electrofishing CPUE of 339.0/h compared to 189.5/h in 2003 (Appendix C).

The bluegill population was also much improved since 2003. Electrofishing CPUE almost doubled and there were significant increases in the CPUE of 4-inch to 6-inch bluegill while CPUE of 2-inch and 3-inch bluegill remained stable (Figure 3). Bluegill sunfish consistently provided an excellent prey base since 1988 (Appendix C). During most sample years, the sample population was made up of almost 70% $\leq$ 4-inch bluegill (Appendix E). Prey availability has been excellent in this reservoir.

Catfishes: The gill net CPUE of blue catfish was 2.8/nn in 2008, an increase from previous years (Figure 4). Relative weight ranged from 85 to over 100, similar to body condition in 2004 and recruitment was evident. Blue catfish grew to 12 inches in 3 to 4 years (N = 5; range = 3 to 4 years) and 76% of the sample population was $\geq$ 12 inches. Total angler harvest was 397 blue catfish from 13 to 16 inches (Figure 5).

The gill net CPUE of channel catfish was 5.5/nn in 2008, down from 8.2/nn in 2004, but consistent with previous survey results (Figure 6 and Appendix C). Relative weights were slightly lower than in 2004, but body condition was still good for a majority of size groups (Figure 6). Recruitment was evident and channel catfish grew to 12 inches in 4 to 6 years (N = 13; range = 3 to 7 years), growth was very slow and length-at-age varied among individuals in the sample. Sixty-one percent of the sample population was $\geq$ 12 inches. Anglers harvested 17,670 channel catfish from 10 to 27 inches (Figure 7). There was evidence of noncompliance.

White bass: The 2008 gill net CPUE of white bass (5.1/nn) reflected an increase from 2004 (4.5/nn; Figure 8) and was consistent with historic values (Appendix C). Improved body condition from previous

surveys was indicated by higher relative weights in 2008 (Figure 8) and 81% of the sample population was ≥ 10 inches. Recruitment was evident and white bass grew to 10 inches in 2 years (N = 6; range = 1 to 2 years). Anglers harvested 23,973 white bass from 10 to 17 inches; average size was 12 inches (Figure 9).

Black basses: The electrofishing total CPUE of spotted bass was 20.0/h, an increase from 2003 (15.0/h, Figure 10), and consistently higher than historic catch rates (Appendix C). Overall abundance increased, recruitment of stock (7-inch) fish doubled, and the numbers of spotted bass > 12 inches have increased. Mean relative weights increased from 85 in 2003 to 95 in 2007. Anglers harvested only 870 spotted bass from 6 to 16 inches, most around 12 to 13 inches (Figure 11).

The electrofishing total CPUE of largemouth bass was 227.0/h more than double the CPUE of 2003 (85.0/h, Figure 12). As with spotted bass, relative abundance increased, and the numbers of largemouth bass within the slot slightly increased. Mean relative weights suggested that largemouth bass were in good condition. Despite the highest CPUE on record, RSD-18 in 2007 was similar to what it was in 1988 (RSD-18 of 5; Appendix F). Growth was average with no evidence of largemouth bass reaching 24 inches (N=34; range 1 - 7 years; Figure 16). Genetic analysis of largemouth bass collected by electrofishing indicated Florida largemouth bass allele's at 37.3%, lowest since 1994 (Table 10). Anglers harvested 7,635 largemouth bass mostly under the slot (Figure 15). There was some noncompliance with fish within the slot.

Ad-hoc electrofishing surveys were conducted in the fall of 2004(Appendix G) and spring of 2005(Appendix H) at selected stations as opposed to random stations. The objective being to compare numbers and size structure of captured fish. There were 24 largemouth bass within the slot collected in the fall of 2004 and 65 collected in the spring of 2005. There were 23 largemouth bass within the slot collected during routine electrofishing in the fall of 2007. Common to all three samples was the absence of largemouth bass ≥ 24 inches.

In summary, low-water levels from June 2005 through May 2007 followed by prolonged flooding during the summer and fall of 2007 contributed to concurrent increases in abundance of clupeids and most centrarchids! The 14- to 24-inch slot length limit does not appear to be accomplishing its intended purpose.

White crappie: The trap net CPUE of white crappie was 7.9/nn (Figure 15), down from 2003 (8.6/nn), but higher than the historical average (Appendix C). Although lower than in 2003, PSD's indicated an adequate size structure that has persisted through previous surveys. Thirty percent of the sample population was ≥ 10 inches and they reach legal size in 1 year (N = 13; all = 1). Mean relative weight varied from 90% to 100% indicating good condition. Historically, in Ray Roberts Reservoir, white crappie have a healthy body condition (Figure 15). Anglers harvested 66,295 white crappie from10 to14 inches; most were 10 and 11 inches (Figure 16).

Fisheries management plan for Ray Roberts Reservoir, Texas

Prepared – July 2008.

ISSUE 1: The current harvest regulation for largemouth bass on Ray Roberts Reservoir, 14- to 24-inch slot length limit is a "Trophy" regulation. However, the reservoir does not support a largemouth bass population that is conducive to a high slot length limit. While the reservoir does support a decent largemouth bass fishery and has produced some ShareLunker bass, it is not particularly productive and may never reach the status of Fork Reservoir. Largemouth bass populations that are suitable for a slot length limit typically have high recruitment and slow growth; hence, the need to harvest bass below the slot. Largemouth bass in Ray Roberts Reservoir had a high CPUE in 2007 (227.0/h), but it was influenced by a large year class that resulted from high water in the spring and summer of 2007. Historically, the CPUE of largemouth bass is not considered high (CPUE for the past 6 surveys, excluding the high water year 2007, was only 91.0/h). Furthermore, growth was average (14 inches = age 2; 18 inches = age 3 -4) and size structure was average (PSD = 25 to 48 and RSD-14 = 7 to 28). The slot length limit is probably not the best regulation for Ray Roberts Reservoir and, in fact, the reservoir is probably better suited for the statewide minimum length limit. The largemouth bass population in Ray Roberts Reservoir is very similar to largemouth bass populations in Lewisville, Buchanan, and Belton Reservoirs, all central Texas reservoirs managed under the statewide 14-inch minimum length limit, 5 fish daily bag. This proposed regulation is better suited for Ray Roberts Reservoir, more angler-friendly, and may have a positive economic impact on the area.

MANAGEMENT STRATEGIES

1. Drop the current 14- to 24-inch slot length limit, 5 fish daily bag limit, only one of which may be 24 inches and longer, September 1, 2009.
2. Implement statewide 14-inch minimum length limit, 5 fish daily bag limit September 1, 2009.

ISSUE 2: Monitor affects of largemouth bass harvest regulation change.

MANAGEMENT STRAGETY

1. Conduct roving creel survey in the fall of 2009 and spring of 2010.

SAMPLING SCHEDULE JUSTIFICATION:

Conduct creel survey fall 2009 and spring 2010. General monitoring surveys in 2011 – 2012 required electrofishing, trap netting, and gill netting. Conduct habitat/vegetation survey in 2011.

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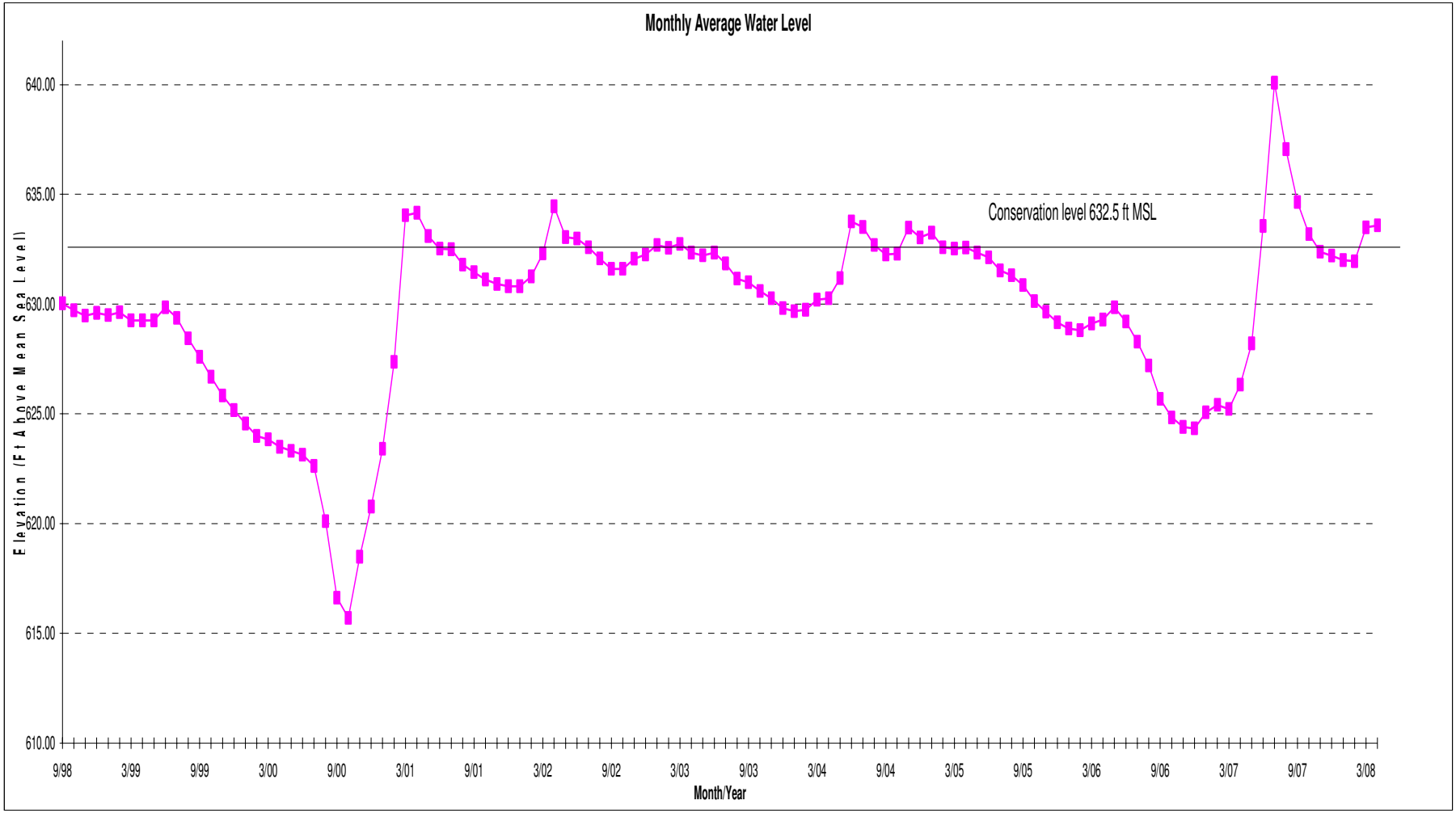


Figure 1. Monthly average water level elevations in feet above mean sea level (MSL) recorded for Lake Ray Roberts, Texas, September 1998 - April 2008.

Table 1. Characteristics of Ray Roberts Reservoir, Texas.

Characteristic	Description
Year constructed	1987
Controlling authority	U. S. Army Corps of Engineers
Counties	Cooke, Denton, and Grayson
Reservoir type	Mainstream
Shoreline development index	8.63
Conductivity	316 µmhos/cm

Table 2. Harvest regulations for Ray Roberts Reservoir.

Species	Bag Limit	Length Limit (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 minimum
Catfish, flathead	5	18 minimum
Bass, white	25	10 minimum
Bass, spotted	5	No limit
Bass, largemouth	5	14 – 24 slot
Crappie: white and black crappie, their hybrids and subspecies.	25 (in any combination)	10 minimum

Table 3. Stocking history of Ray Roberts, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Channel catfish	1986	50,004	AFGL	4.3
	Total	50,004		
Coppernose bluegill	1987	234,506	AFGL	2.0
	1987	110,002	FRY	1.0
	Total	344,508		
Florida Largemouth bass	1985	59,900	FRY	1.0
	1987	78	ADL	12.0
	1987	100,262	FRY	1.0
	1989	733,750	FRY	0.8
	1993	133,630	FGL	1.5
	1994	600,809	FGL	1.3
	2000	502,121	FGL	1.4
	2001	522,791	FGL	1.5
	2005	14,839	FGL	2.1
	Total	2,668,180		
Threadfin shad	1985	1,200	AFGL	3.0
	Total	1,200		

Table 4. Survey of littoral zone and physical habitat types, Ray Roberts Reservoir, Texas, 2003. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Shoreline distance		Surface area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Riprap	2.0	1.0		
Rocky shore	10.0	4.8		
Boulder	0.7	0.3		
Eroded bank	5.3	2.6		
Featureless	5.3	2.6		
Flooded live terrestrial vegetation	14.0	6.8		
Native floating vegetation	36.0	17.4	12.0	<0.1
Native submerged vegetation	36.0	17.4	1200.0	3.4
Native emergent vegetation	1.5	0.7	5.5	<0.1
Hydrilla	11.4	5.5	300.0	0.8
Eurasian water milfoil	28.6	13.8	752.7	2.1
Boat docks	1.0	0.5	6.0	<0.1
Dead trees	55.2	26.6	3000.0	12.0

Table 5. Percent directed angler effort by species for Ray Roberts Reservoir, Texas, June 2004-May 2005.

Species	Year
	2004/2005
Channel catfish	8.0
White bass	4.1
Sunfishes	0.7
Largemouth bass	38.0
White crappie	26.4
Anything	22.9

Table 6. Total fishing effort (h) for all species and total directed expenditures at for Ray Roberts Reservoir, Texas, June 2004 - May 2005.

Creel Statistic	Year
	2004/2005
Total fishing effort	312,511h
Total directed expenditures	$1,541,876.00

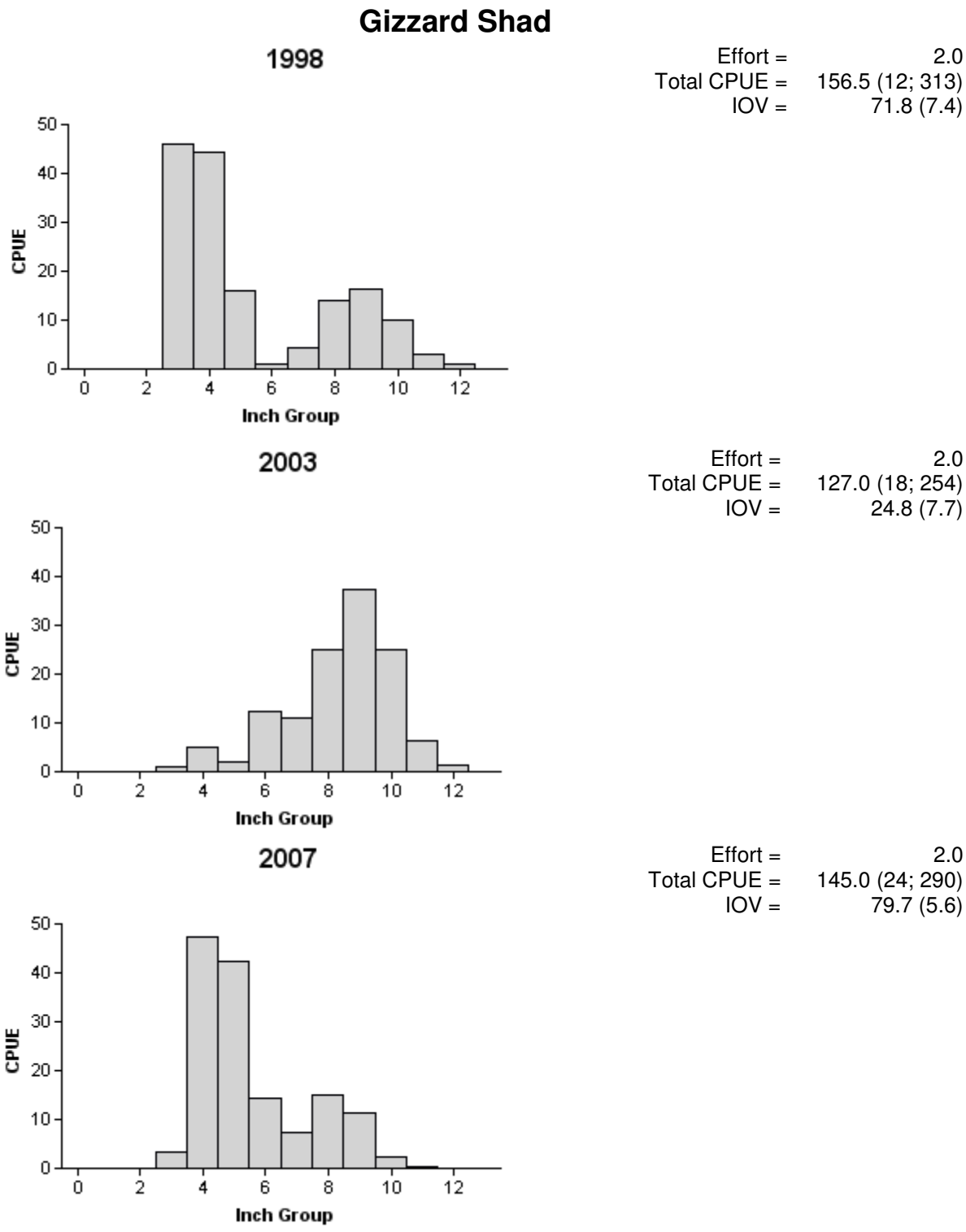


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Ray Roberts Reservoir, Texas 1998, 2003, and 2007.

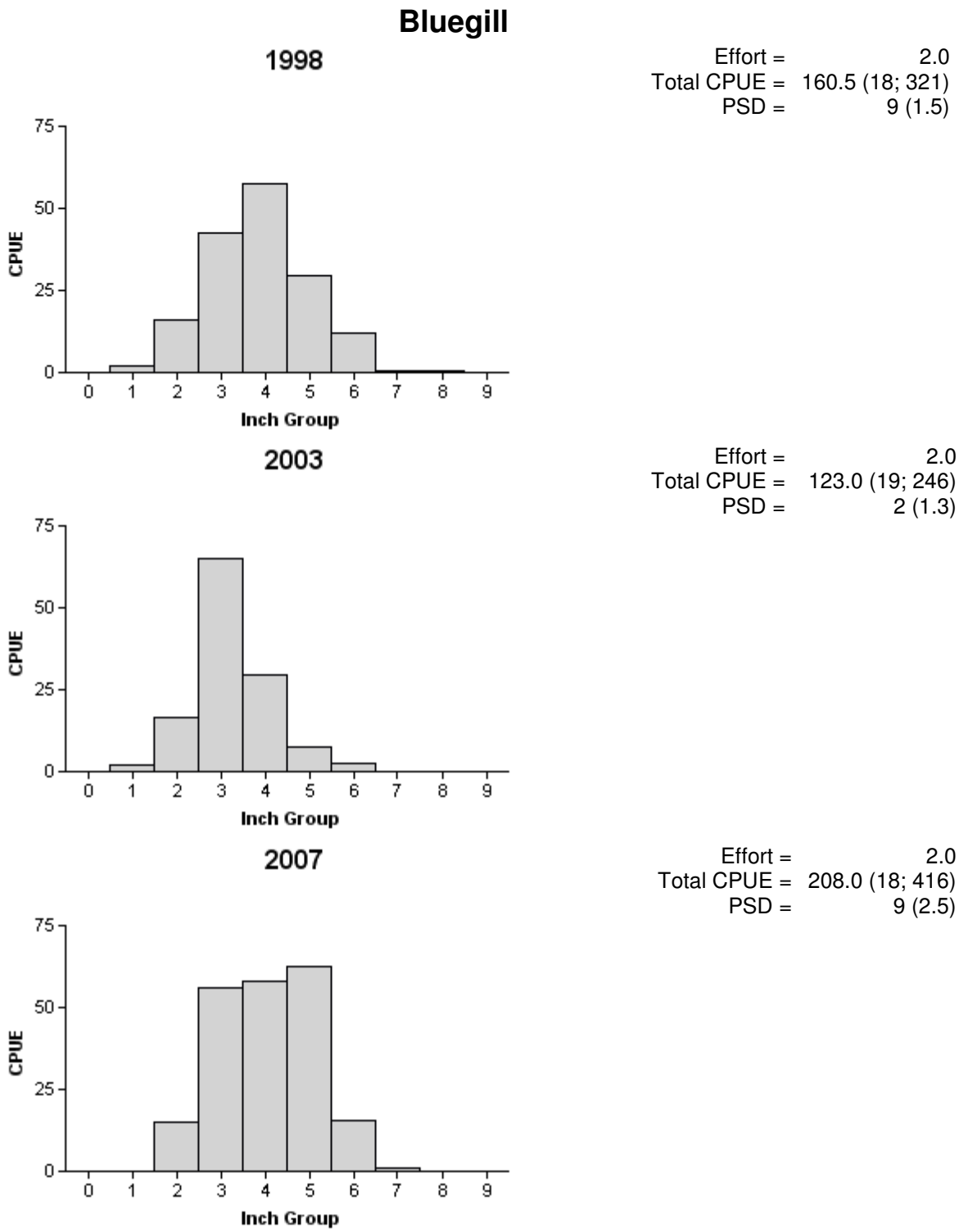


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Ray Roberts Reservoir, Texas, 1998, 2003, and 2007.

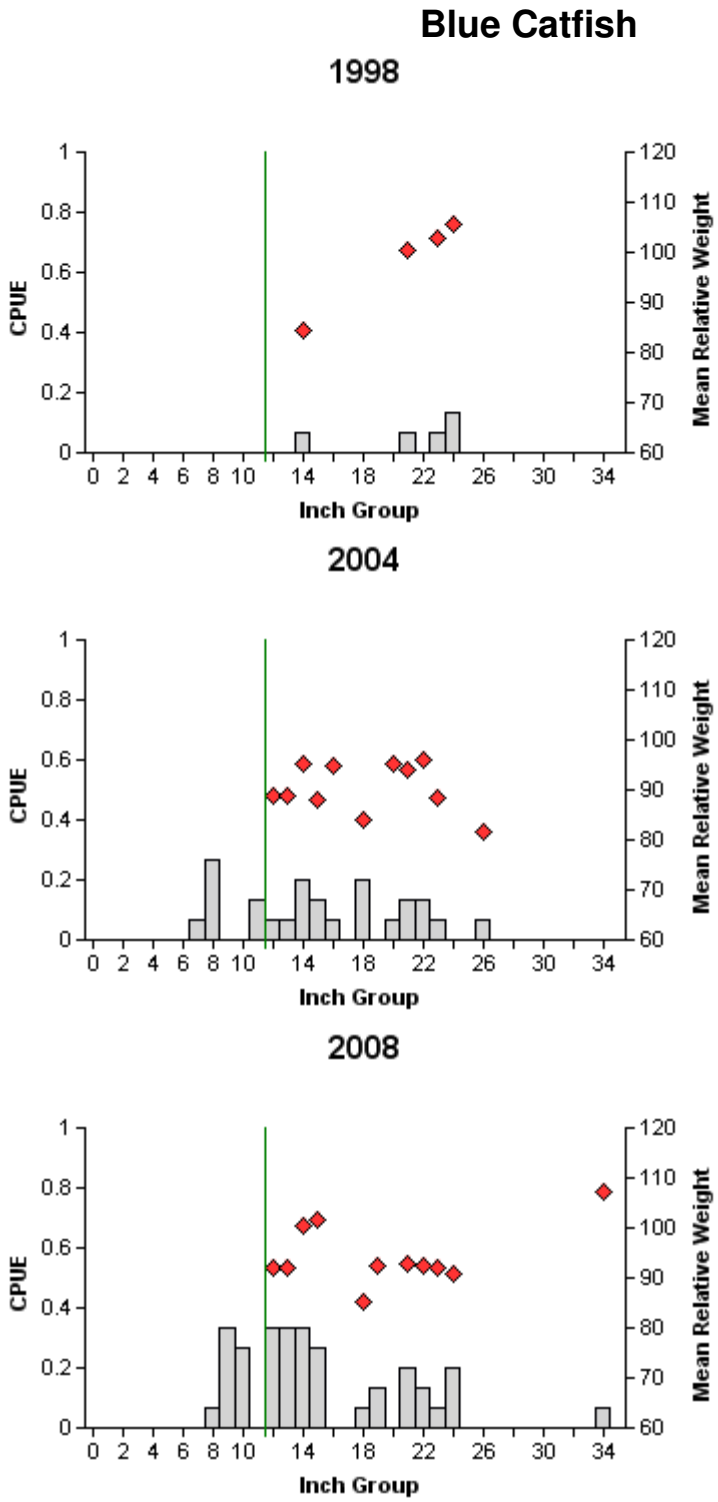


Figure 4. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Roberts Reservoir, Texas, 1998, 2004, and 2008. Vertical lines represent length limit at time of collection.

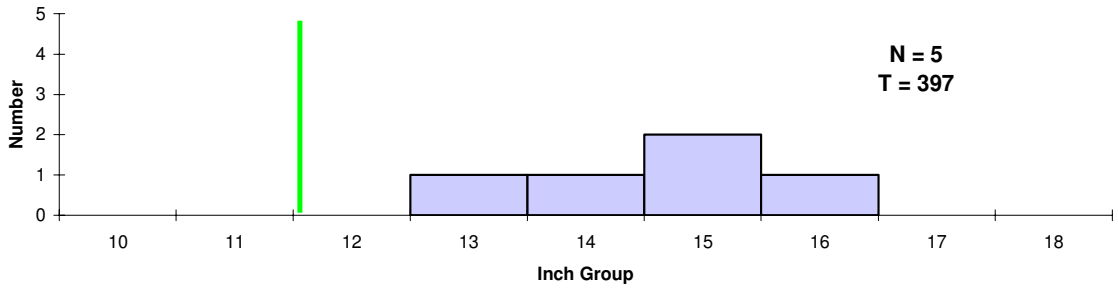


Figure 5. Length frequency of harvested blue catfish observed during creel surveys at Ray Roberts Reservoir, Texas, June 2004 through May 2005, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and T is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

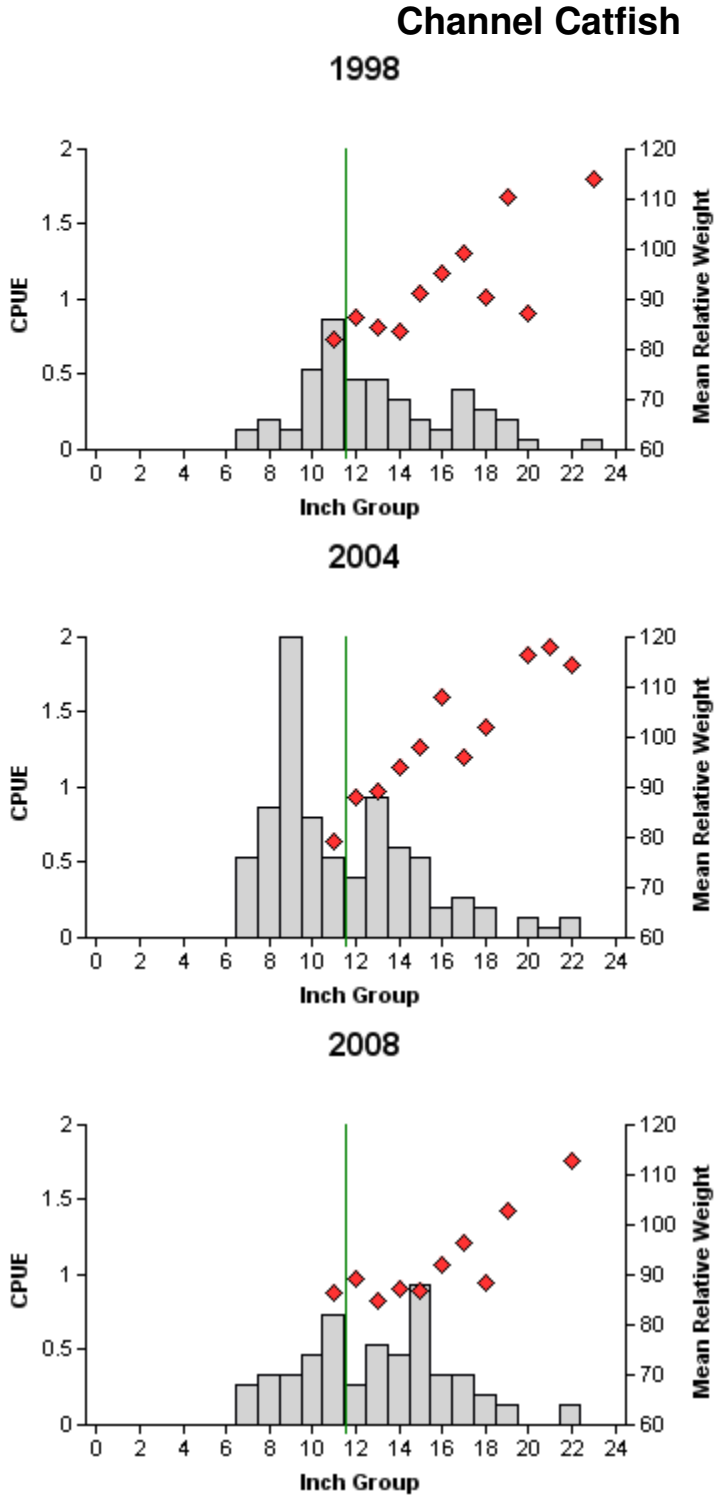
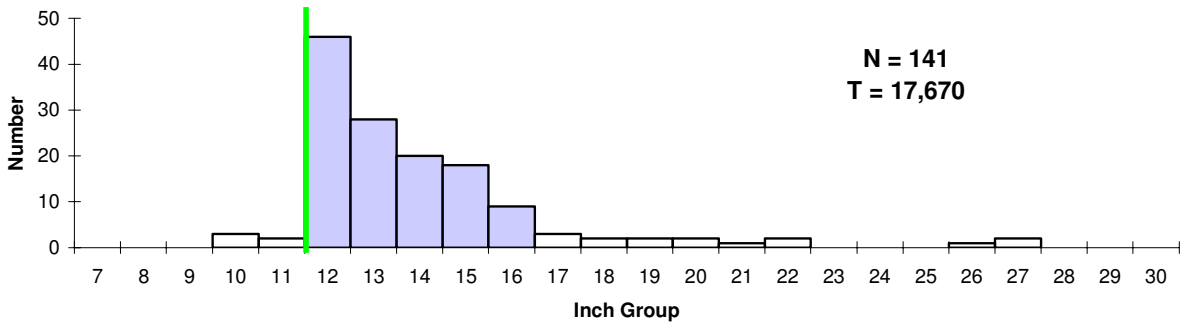


Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Roberts Reservoir, Texas, 1998, 2004, and 2008. Vertical lines represent length limit at time of collection.

Table 7. Creel survey statistics for channel catfish at Ray Roberts Reservoir from June 2004 – May 2005, where total catch per hour is for anglers targeting channel catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year
Creel Survey Statistic	2004/2005
Directed effort (h)	25,142
Directed effort/acre	0.98
Total catch per hour	0.92 (97)
Total harvest	17,670 (34)
Harvest/acre	0.69 (34)



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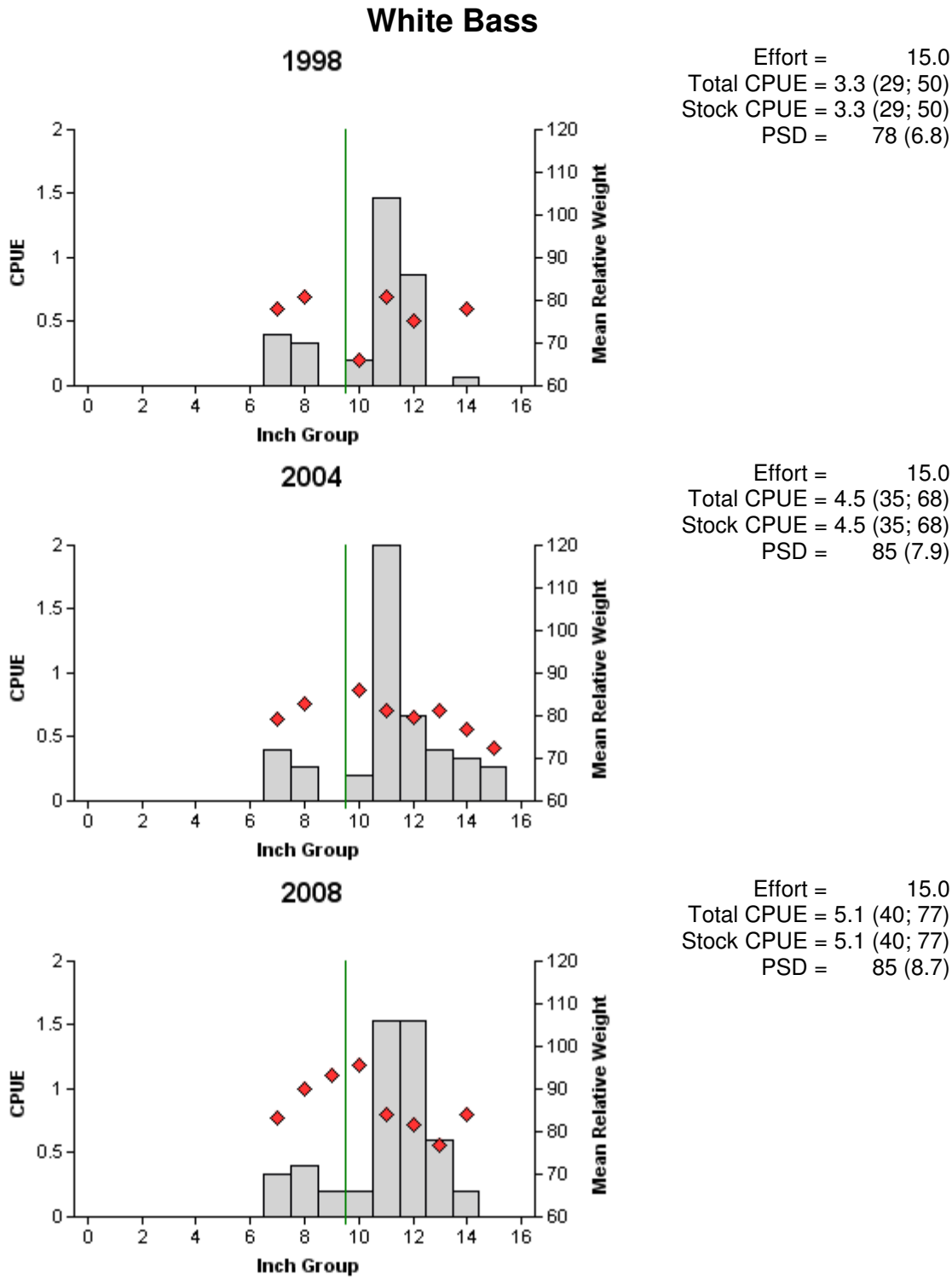


Figure 8. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Roberts Reservoir, Texas, 1998, 2004, and 2008. Vertical lines represent length limit at time of collection.

Table 8. Creel survey statistics for white bass at Ray Roberts Reservoir from June 2004 – May 2005, where total catch per hour is for anglers targeting white bass and total harvest is the estimated number of white bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year
Creel Survey Statistic	2004/2005
Directed effort (h)	10,271.66 (30)
Directed effort/acre	0.40 (30)
Total catch per hour	2.85 (72)
Total harvest	23,973 (33)
Harvest/acre	0.94 (33)

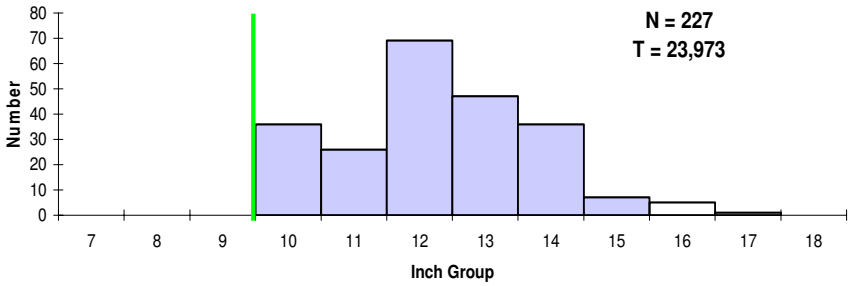


Figure 9. Length frequency of harvested white bass observed during creel surveys at Ray Roberts Reservoir, Texas, June 2004 through May 2005, all anglers combined. N is the number of harvested white bass observed during creel surveys, and T is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

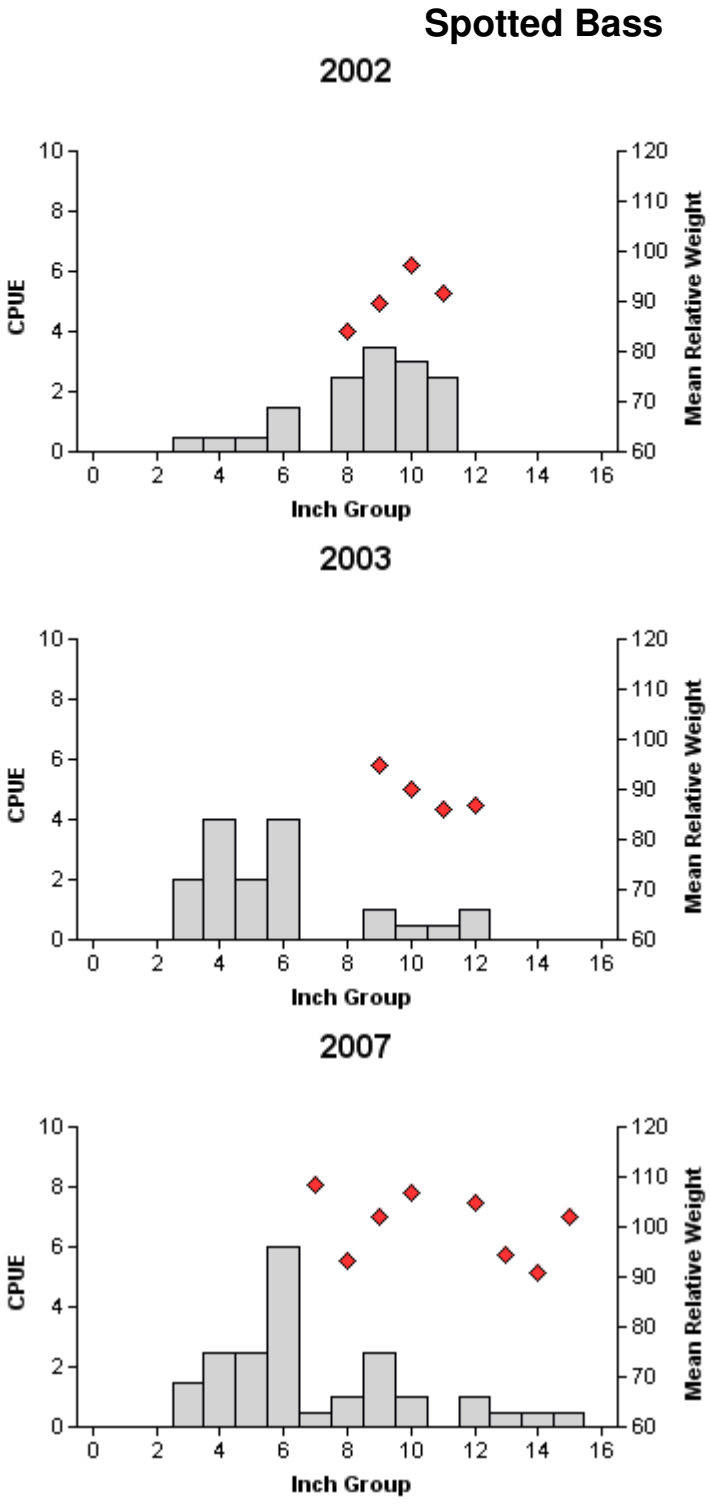


Figure 10. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Ray Roberts Reservoir, Texas, 2002, 2003, and 2007.

Table 9. Creel survey statistics for spotted bass at Ray Roberts Reservoir from June 2004 – May 2005, where total catch per hour is for anglers targeting spotted bass and total harvest is the estimated number of spotted bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year
Creel Survey Statistic	2004/2005
Total harvest of spotted bass	870 (217)
Harvest/acre of spotted bass	0.03 (217)

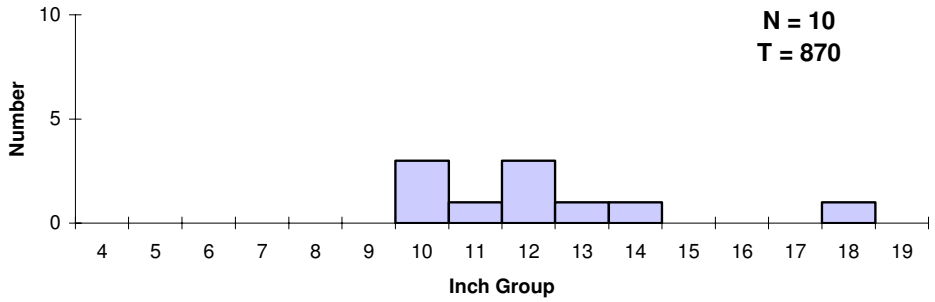
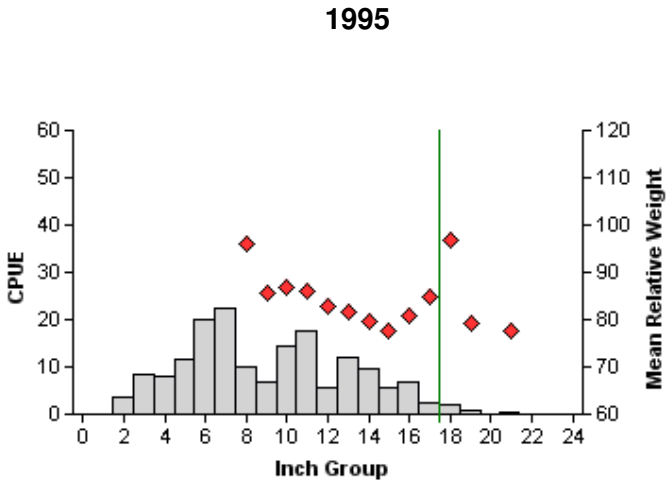
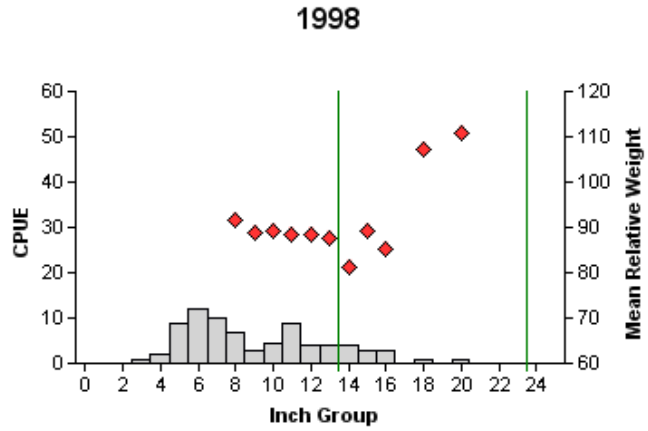


Figure 11. Length frequency of harvested spotted bass observed during creel surveys at Ray Roberts Reservoir, Texas, June 2004 through May 2005, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and T is the total estimated harvest for the creel period.

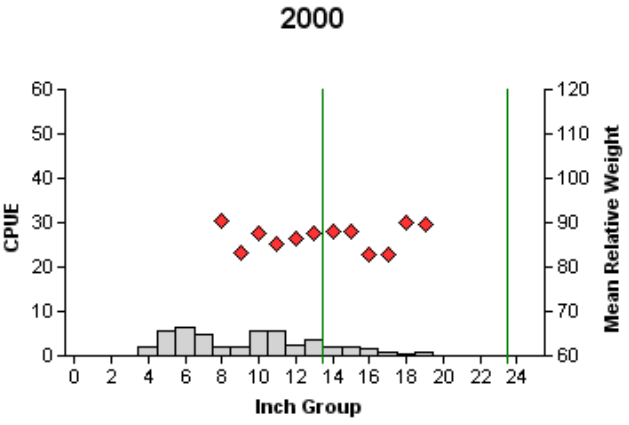
Largemouth Bass



Effort =	2.0
Total CPUE =	168.5 (337; 22)
Stock CPUE =	94.5 (189; 18)
PSD =	48 (5.9)



Effort =	2.0
Total CPUE =	77.5 (19; 155)
Stock CPUE =	43.5 (21; 87)
PSD =	46 (5.5)



Effort =	2.0
Total CPUE =	48.0 (25; 96)
Stock CPUE =	29.0 (23; 58)
PSD =	48 (8.4)

Figure 12. 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, Ray Roberts Reservoir, Texas, 1995, 1998, 2000, 2001, 2002, 2003, and 2007. Vertical lines represent length limit at time of collection. Note 14- 24-inch slot was implemented September

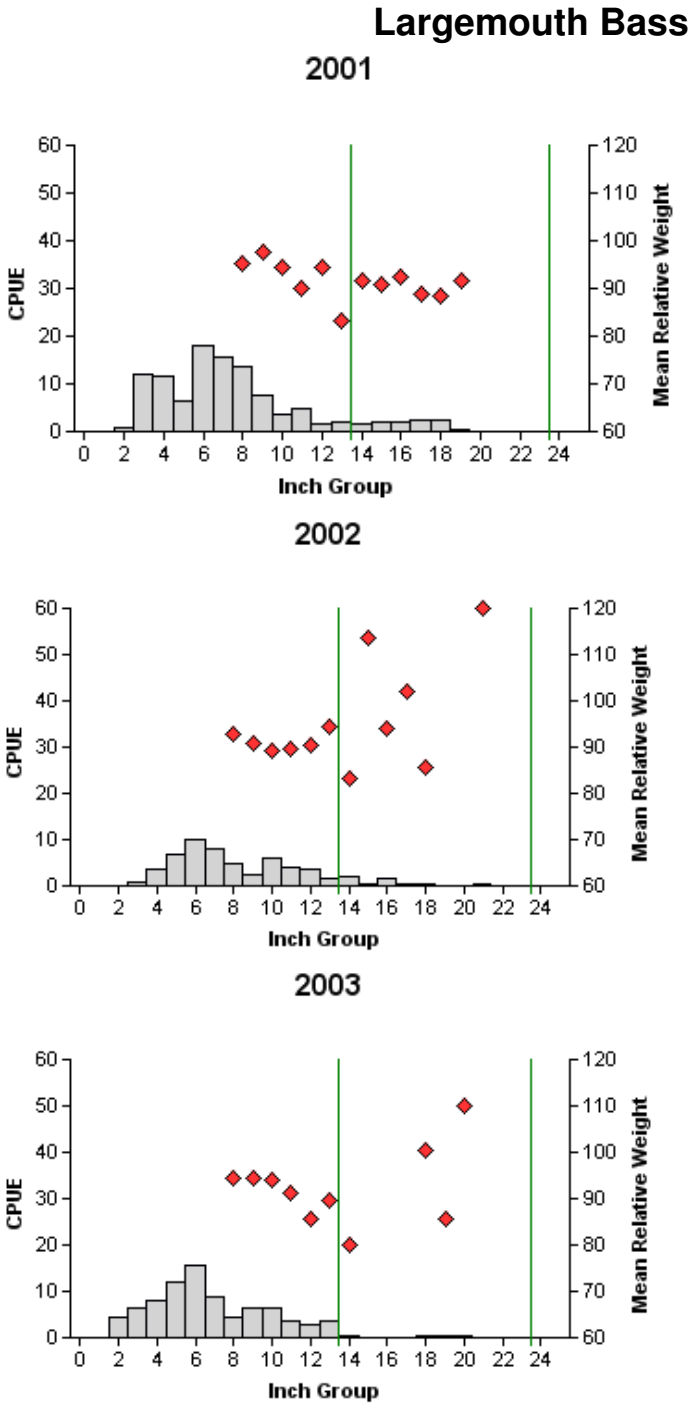
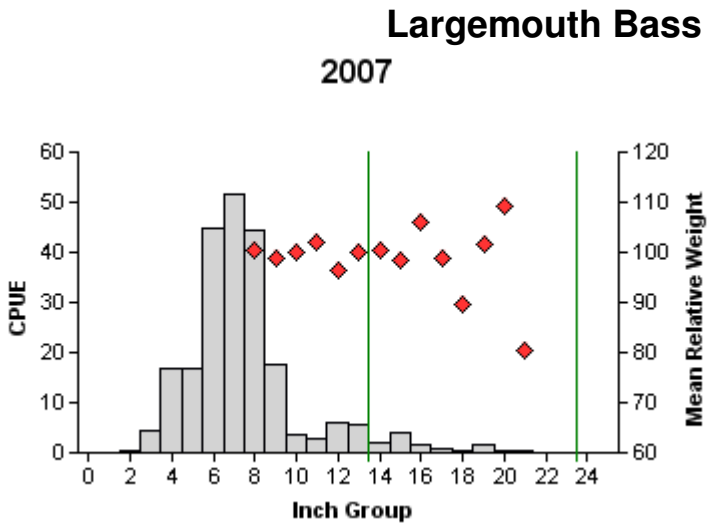


Figure 12 continued.



Effort = 2.0
Total CPUE = 227.0 (12; 454)
Stock CPUE = 91.5 (16; 183)
PSD = 25 (3.9)

Figure 12 continued.

Table 10. Results of genetic analysis of largemouth bass collected by fall electrofishing, Ray Roberts Reservoir, Texas, 1990, 1992, 1994, 1998, 2000 – 2004, and 2007. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Hybrids = cross between a FLMB and a NLMB.

		Genotype				
Year	Sample size	FLMB	Hybrids	NLMB	% FLMB alleles	% pure FLMB
1990	37	0	17	20	17.6	0.0
1992	30	0	9	21	15.0	0.0
1994	26	4	11	11	33.7	15.4
1998	40	4	27	9	40.0	10.0
2000	35	9	21	5	61.4	25.7
2001	40	24	13	3	78.8	60.0
2002	30	3	24	3	50.8	10.3
2003	30	5	24	1	56.7	16.7
2004	59	7	48	4	49.2	11.9
2007	30	0	28	2	37.3	0.0

Table 11. Creel survey statistics for largemouth bass at Ray Roberts Reservoir from June 2004 – May 2005, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year
Creel Survey Statistic	2004/2005
Directed effort (h)	119,065.48 (14)
Directed effort/acre	4.65 (14)
Total catch per hour	0.34 (22)
Total harvest	7,635.00 (48)
Harvest/acre	0.30

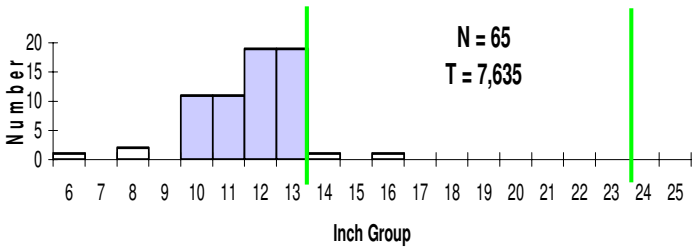


Figure 13. Length frequency of harvested largemouth bass observed during creel surveys at Ray Roberts Reservoir, Texas, June 2004 through May 2005, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and T is the total estimated harvest for the creel period. Vertical lines represent slot length limit at time of creel survey.

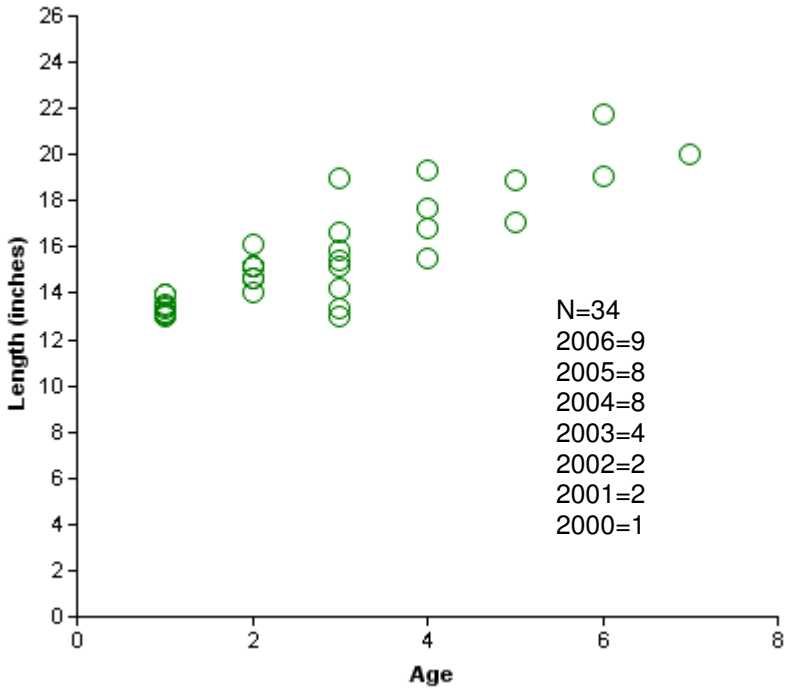


Figure 14. Length at age for largemouth bass collected from electrofishing at Ray Roberts Reservoir, Texas, November 2007.

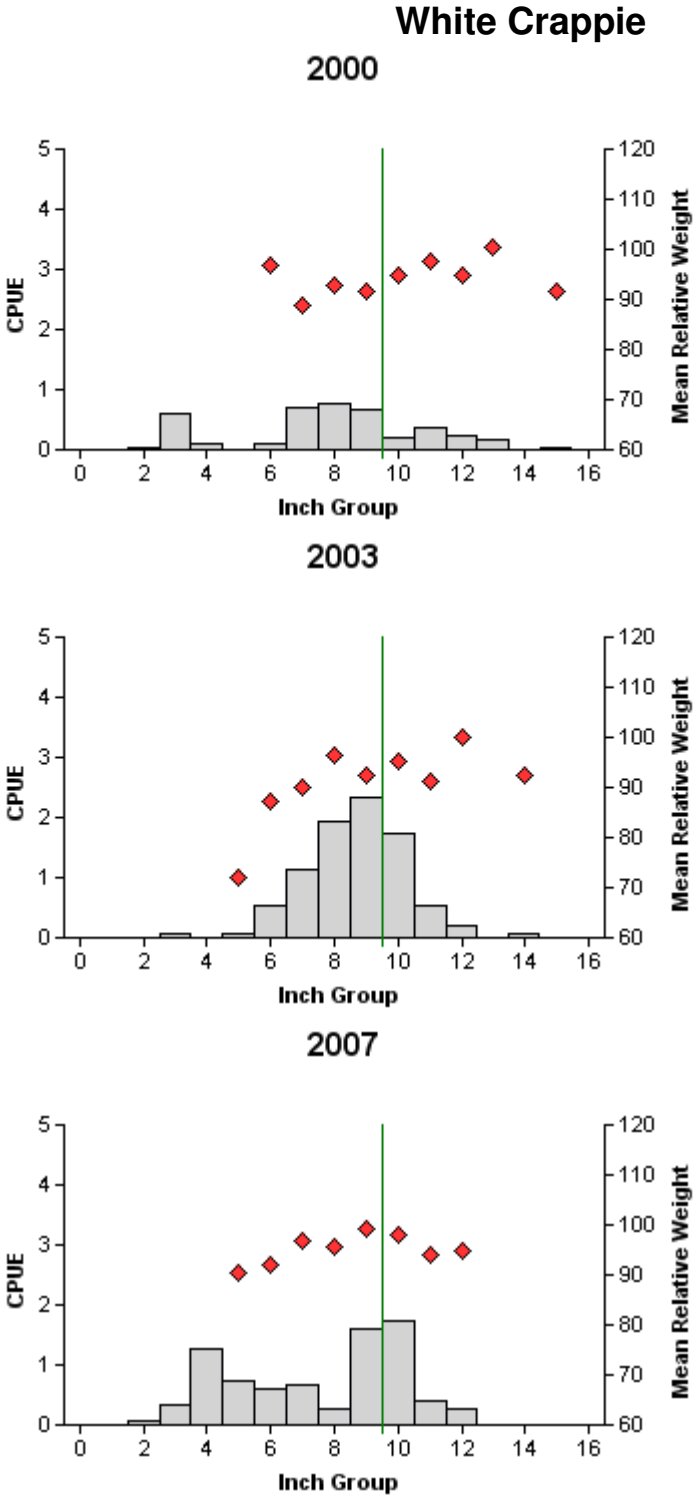


Figure 15. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Ray Roberts Reservoir, Texas, 2000, 2003, and 2007. Vertical lines represent length limit at time of collection.

Table 12. Creel survey statistics for white crappie at Ray Roberts Reservoir from June 2004 – May 2005, where total catch per hour is for anglers targeting white crappie and total harvest is the estimated number of white crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year
Creel Survey Statistic	2004/2005
Directed effort (h)	82,654.75 (14)
Directed effort/acre	3.23 (14)
Total catch per hour	1.86 (26)
Total harvest	66,295.00 (24)
Harvest/acre	2.59 (24)

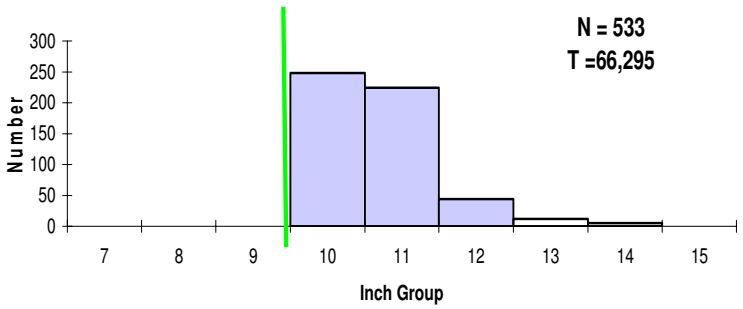


Figure 16. Length frequency of harvested white crappie observed during creel surveys at Ray Roberts Reservoir, Texas, June 2004 through May 2005, all anglers combined. N is the number of harvested white crappie observed during creel surveys, and T is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

Table 13. Proposed sampling schedule for Ray Roberts Reservoir, Texas. Electrofishing and trap netting surveys are conducted in the fall, while gill netting surveys are conducted during the following spring. Additional survey denoted by A. Standard survey denoted by S.

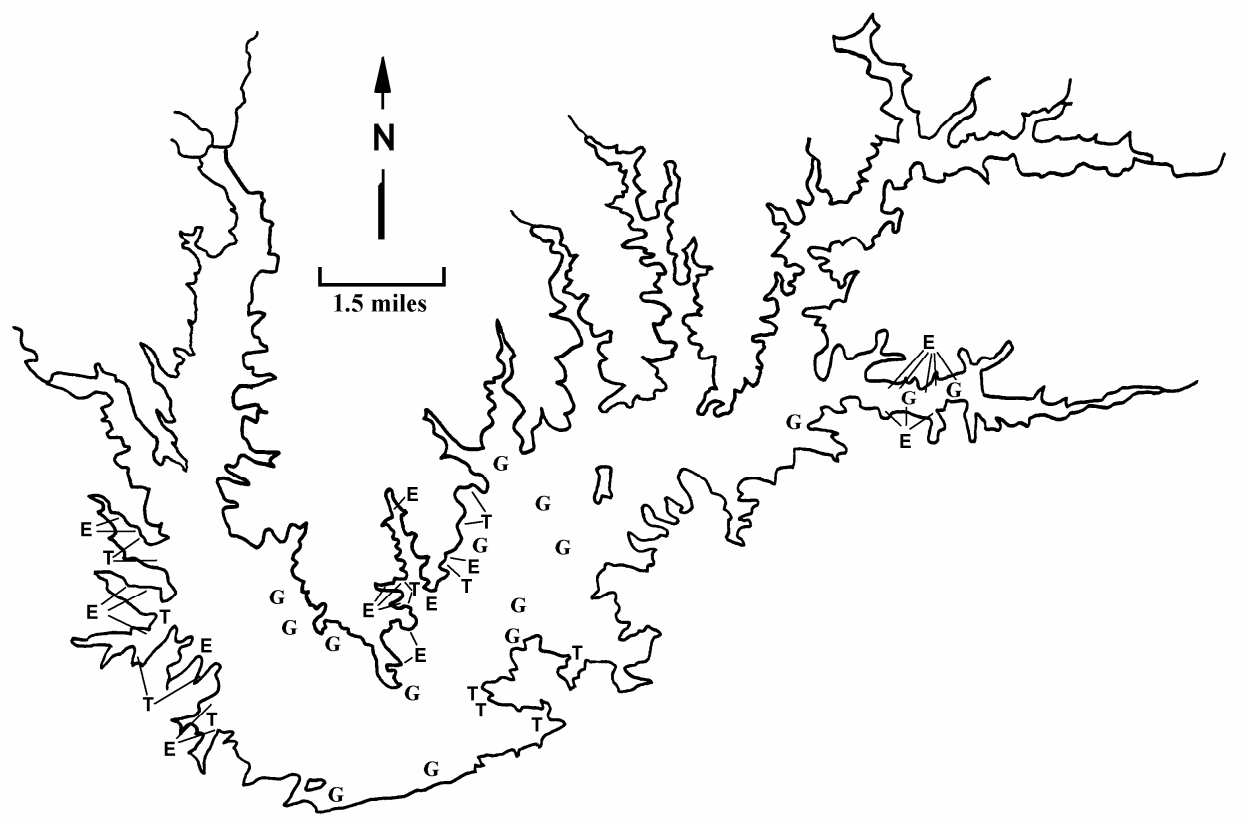
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2008-Spring 2009					
Fall 2009-Spring 2010				A	
Fall 2010-Spring 2011					
Fall 2011-Spring 2012	S	S	S		S

Appendix A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Ray Roberts Reservoir, Texas, 2007-2008.

	Gill Netting		Trap Netting		Electrofishing	
Species	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					290	145.0
Threadfin shad					678	339.0
Blue catfish	42	2.8				
Channel catfish	82	5.5				
Flathead catfish	2	0.1				
White bass	77	5.1				
Green sunfish					96	48.0
Warmouth					66	33.0
Orangespotted sunfish					6	3.0
Bluegill					416	208.0
Longear sunfish					509	254.5
Redear sunfish					36	18.0
Spotted bass					40	20.0
Largemouth bass					454	227.0
White crappie			119	7.9		
Black crappie			5	0.3		

APPENDIX B



Location of sampling sites, Ray Roberts Reservoir, Texas, 2007-2008. Trap netting, gill netting, and electrofishing stations are indicated by T, G, and E, respectively. Water level was at conservation level for electrofishing and trap netting, and 1 foot below conservation level during gill netting.

APPENDIX C

Catch rates (CPUE) of targeted species by gear type for Ray Roberts Reservoir, Texas, 1995, 1998, 2000, 2001, 2002, 2003, 2004, 2007, and 2008.

		Year								
Gear	Species	1995[a]	1998[b]	2000[b,c]	2001[b,d]	2002[b,d]	2003[b]	2004[b]	2007[b,d]	2008[b]
Gill Net	Blue catfish	0.0	0.3					1.7		2.8
(fish/net night)	Channel catfish	6.0	4.5					8.2		5.5
	Flathead catfish	0.0	0.1					0.0		0.1
	White bass	5.8	3.3					4.5		5.1
Electrofisher	Gizzard shad	130.5	156.5				127.0		145.0	
(fish/hour)	Threadfin shad	55.5	61.0				189.5		339.0	
	Green sunfish	9.5	2.5				2.5		48.0	
	Warmouth	7.5	12.0				5.5		33.0	
	Orangespotted sunfish						1.0		3.0	
	Bluegill	323.5	160.5				123.0		208.0	
	Longear sunfish	49.5	42.0				77.5		254.5	
	Redear sunfish	0.5	6.0				3.5		18.0	
	Spotted bass				5.0	14.5	15.0		20.0	
	Largemouth bass	168.5	77.5	48.0	108.5	57.5	85.0		227.0	
Trap Net	White crappie	10.9	2.7	4.0			8.6		7.9	
(fish/net night)	Black crappie	0.0	0.1	0.2			0.3		0.3	

[a] All sampling stations for all gear were subjectively selected.
[b] All sampling stations for all gear were randomly selected.
[c] Bass and shad only electrofishing survey.
[d] Electrofishing survey was conducted using a Smith-Root 7.5 GPP (Gas Powered Pulsator). Electrofishing surveys prior to 2007 were conducted using a Smith-Root 5.0 GPP.

APPENDIX D

Gizzard shad fall electrofishing statistics for Ray Roberts Reservoir, Texas, 1988, 1990, 1992, 1995, 1998, 2003, and 2007.

Year	IOV	Total CPUE
2007	79.7	145.0
2003	25.0	127.0
1998	35.8	156.5
1995	35.6	130.5
1992	36.5	193.0
1990	63.0	388.0
1988	61.0	150.0

APPENDIX E

Bluegill fall electrofishing statistics for Ray Roberts Reservoir, Texas, 1988, 1990, 1992, 1995, 1998, 2003, and 2007.

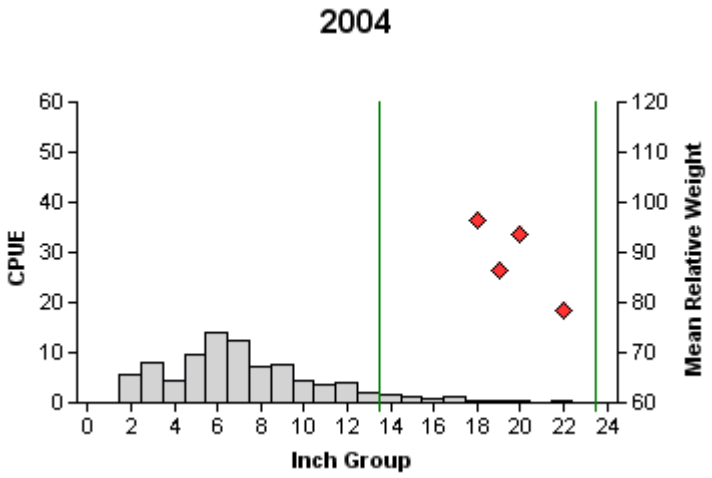
Year	% ≤ 4 inches	Total CPUE
2007	62.0	208.0
2003	92.0	123.0
1998	47.0	160.5
1995	92.1	323.5
1992	75.0	72.0
1990	46.2	361.5
1988	68.5	86.7

APPENDIX F

Largemouth bass fall electrofishing fish stock assessment for Ray Roberts Reservoir, Texas, 1988, 1990, 1992, 1995, 1996, 1998, 2000 – 2003, and 2007.

Year	Total CPUE	% ≥ 14 inches	RSD – 14	RSD – 18
2007	227.0	5.0	13	3
2003	85.0	2.4	7	5
2002	57.5	9.6	20	4
2001	108.5	10.0	25	7
2000	48.0	17.0	28	5
1998	77.5	15.0	28	5
1996	95.2	23.0	37	10
1995	168.5	17.0	30	4
1992	123.0	16.7	25	5
1990	169.5	6.2	10	< 0.5
1988	86.7	10.8	21	5

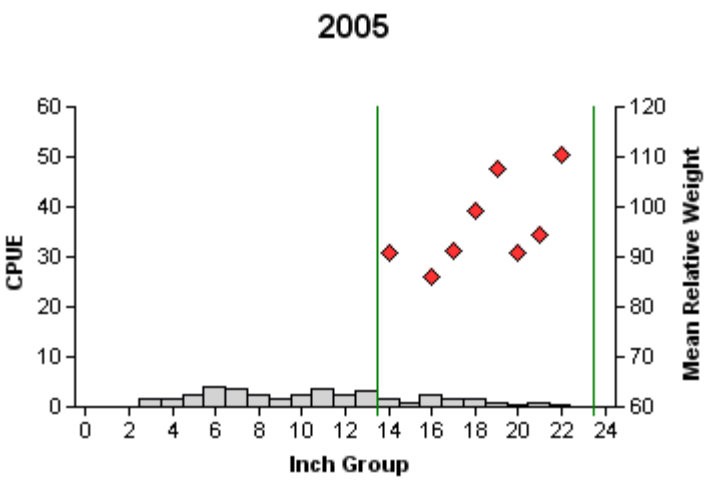
APPENDIX G



Effort = 4.0
Total CPUE = 88.7 (21; 352)
Stock CPUE = 35.0 (24; 139)
PSD = 35 (5.4)

Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall 2004 electrofishing survey, Ray Roberts Reservoir, Texas. Vertical lines represent slot length limit.

APPENDIX H



Effort = 6.3
Total CPUE = 38.8 (16; 246)
Stock CPUE = 25.4 (14; 161)
PSD = 61 (6.6)

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 spring 2005 electrofishing survey, Ray Roberts Reservoir, Texas. Vertical lines represent slot length limit.

APPENDIX I

Quarterly creel survey statistics for largemouth bass at Ray Roberts Reservoir from June 2004 – May 2005, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Quarter			
Creel Survey Statistic	Summer (June-August)	Fall (September-November)	Winter (December-February)	Spring (March-April)
Directed effort (h)	35,618.28 (25)	36,208.79 (24)	5,799.31 (34)	41,439.10 (28)
Directed effort/acre	1.39	1.41	0.23	1.62
Total catch per hour	0.37 (23)	0.46 (18)	0.23 (73)	0.23 (26)
Total harvest	1,193 (95)	4195 (53)	0	2247 (113)
Harvest/acre	0.05	0.16	0.00	0.09