PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-1

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2010 Survey Report

Moss Reservoir

Prepared by:

John H. Moczygemba, Assistant District Management Supervisor
and
Bruce Hysmith, District Management Supervisor

Inland Fisheries Division
District 2A, Pottsboro, Texas

Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

July 31, 2011

TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Moss Reservoir were surveyed in 2010 using an electrofisher and trap nets and in 2011 using gill nets. Habitat was surveyed in 2010. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Moss Reservoir is a 1,140-acre impoundment on Fish Creek, a tributary of the Red River, in Cooke County. Except in April 2009, when the water level was 12 feet above the spillway, water level has been within 2 feet of conservation pool since May 2007. The reservoir productivity has increased because of increases of housing development and agriculture use on the watershed. Habitat features consisted mainly of rocky shoreline and native submerged and emergent vegetation. Standing timber was also present.

- **Management history:** Important sport fish include channel catfish, largemouth bass, and white bass. The management plan from the 2006 survey report included a recommendation to improve access for the physically challenged. Improvements to the handicap facilities have been done. In addition 97 surplus brood Florida bass (average 18 inches) were stocked in 2010 to supplement the Florida bass population.

- **Fish community**

  - **Prey species:** Electrofishing catch rate of gizzard shad was low, as in previous surveys. The relative abundance of prey-size gizzard shad ($\leq$ 7-inches) continued to be low. Electrofishing catch rates of threadfin shad and bluegill have decreased from previous surveys, but catch rates of longear sunfish were just above the reservoir average. Overall the prey base was adequate.

  - **Channel catfish:** Gill net catch rate of channel catfish increased over the 2007 survey, and most of the population was legal size and in fair to excellent condition. Recruitment was evident.

  - **White bass:** The historical catch rate of white bass has always been low and this survey had the lowest catch rate on record. The entire sample was legal size and their relative weights were moderate. This may have been the result from the low IOV for gizzard shad. Moss Reservoir is not suitable for white bass because of reservoir size and low forage base.

  - **Black basses:** Spotted bass electrofishing catch rates were similar to past years. Their body condition was good. Electrofishing catch rate of largemouth bass was the lowest on record after a high the previous survey. Growth rates were slow; however, the fish were in good condition.

  - **White crappie:** Trap net catch rate of white crappie was again a record high; the crappie population in the reservoir seems to be increasing. The crappie were in good condition and growth rates were average.

- **Management strategies:** Collect additional largemouth bass for aging in fall 2011. Inform the Moss Reservoir controlling authority about new exotic species threats to Texas waters, and work with them to display appropriate signage, educate constituents, and understand appropriate enforcement actions. Conduct general monitoring with electrofisher, trap nets, and gill nets in 2014-2015.

INTRODUCTION

This document is a summary of fisheries data collected from Moss Reservoir in 2010-2011. 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 2010-2011 data for comparison.

Reservoir Description

Moss Reservoir is a 1,140-acre impoundment on Fish Creek, a tributary of the Red River, in Cooke County. It was constructed in 1966 by the City of Gainesville for municipal and industrial water supply and recreation. The City of Gainesville charges $35 for an annual (January 1 to December 31) boat access permit. There is no charge for bank angling. The average depth is 20.6 feet with a maximum depth of 68 feet. Except in April 2009, when the water level was 12 feet above the spillway level, water level has been within 2 feet of conservation level (715 feet above mean sea level) since May 2007 (Figure 1). Moss Reservoir has a drainage area of approximately 65 square miles, a shoreline length of 16 miles, and a shoreline development index of 3.43. Approximately 42% of the reservoir was $\leq$ 15 feet deep. Moss Reservoir was slightly eutrophic with a mean TSI chl-*a* of 47.1 (Texas Commission on Environmental Quality 2008). A TSI chl-a index between 45 and 55 is considered eutrophic. Average Secchi disk transparency was 104 cm for 2010 and suggested mild eutrophic conditions as per Carlson's Trophic State Index (Texas Commission on Environmental Quality 2008). In previous surveys the reservoir reflected low to moderate productivity with a Carlson's Trophic State Index near 35, which suggested a low productivity reservoir. The watersheds of South and North Fish Creeks, which are very clear water streams running over limestone bedrock, contributed very little nutrients. However, agriculture has increased on the South Fish Creek watershed, thereby increasing nutrients entering the reservoir. Also new houses are being built on the shoreline, which would increase nutrient inflow. Habitat at time of sampling consisted of native emergent vegetation, native submerged vegetation, rocky shoreline, and dead trees. Native aquatic plants present were southern naiad, muskgrass, cattail, coontail, and water willow. Hydrilla, a non-native aquatic plant, was first discovered in two coves in August, 2003. Presently it is confined to one cove near the north launch ramp. Another invasive, yellow floating-heart, has appeared in a small area near the south boat ramp. Boat access consisted of two public boat ramps on the north and south sides of the reservoir. The two public boat ramps are in good shape and have ample lighting. Bank fishing access near each boat ramp was augmented by a fishing pier, which are handicap accessible. Other descriptive characteristics for Moss Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Hysmith and Moczygemba 2007) included:

1. Encourage the City of Gainesville to develop facilities for handicapped anglers.
   Action: The City was appraised of the situation. Access facilities have been constructed at the fishing piers.

Harvest regulation history: Sport fishes in Moss Reservoir are currently managed with statewide regulations (Table 2).

Stocking history: In 2010, 97 adult Florida largemouth bass were stocked into Moss Reservoir. Refer to Table 3 for a comprehensive stocking list for this reservoir.

Vegetation/habitat history: Moss Reservoir supported submerged and emergent aquatic vegetation (Table 4). Historically, submerged aquatic vegetation (muskgrass, southern naiad, and coontail) was common, but not problematic (Hysmith and Moczygemba 2007). These species persist currently and provide fish habitat. Historically and currently, water willow is abundant along a third of the shoreline. The

persistence of water willow along the shoreline probably contributes to the success of largemouth bass recruitment in this reservoir (Aggus and Elliott 1975). Hydrilla was first observed in August 2003 in two coves. Presently hydrilla is found only sparsely in one cove near the north boat ramp and is not problematic. Historically, as well as currently, rocky shoreline provides the most fishery habitat in Moss Reservoir (Table 4; Hysmith and Moczygemba 2007).

Water Transfer: Moss Reservoir is primarily used for municipal water supply, recreation, and to a lesser extent, flood control. The City of Gainesville operates one pumping station that provides 1 MGD to the City of Gainesville. There are plans to increase the volume of pumping later this year. There is no water pumped into Moss Reservoir.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (5 net nights at 5 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). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). Habitat and vegetation surveys were also conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and condition indices [relative weights (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Ages were determined using Category 2 protocol and otoliths from 12 to 13 fish according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). The manual specifies for largemouth bass only, but we adapted white crappie to the protocol for identifying the number of white crappie to sample. Source for water level data was the United States Geological Survey (USGS) website.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of rocky shoreline, bulkhead, dead trees, and native emergent and native submerged vegetation (Table 4). Yellow floating-heart was discovered near the south boat ramp in 2010.

Prey species: Electrofishing catch rates of gizzard and threadfin shad were 23.0/h and 3.0/h, respectively (Appendix C). Index of vulnerability (IOV) for gizzard shad in 2010 (39) was much improved over the 2006 survey (4). The IOV estimates for Moss Reservoir have historically been low (Figure 2). Total CPUE of gizzard shad was higher in 2010 compared to the 2002 survey (Figure 2), but about the same as the 2006 survey. The catch rate of threadfin shad went from 173.0/h in 2006 to 3.0/h, which is well below the reservoir average of 81.4/h (Appendix C). For the past three surveys, the size structure of bluegill was dominated by small individuals $\leq$ 3 inches, supplementing the decrease of threadfin shad abundance (Figure 3 and Appendix C). The total CPUE of bluegill was 186.0/h in 2010, almost the same as the 187.0/h collected in 2006, but below the reservoir average of 236.0/h. Longear sunfish contributed to the prey base with a total CPUE of 46.0/h, which is just above the reservoir average of 45.1/h (Appendix C)

Channel catfish: The gill net catch rate of channel catfish was 3.2/nn in 2011, more than double the catch rate of 1.4 in 2007 (Figure 4 and Appendix C). Relative weights were variable, ranging from 80 to 122, with most channel catfish in good to excellent condition. Over 40% of the sample was legal size and

larger. As in past surveys catch of sub-legal size fish was low, but the catch verified reproduction.

White bass: The gill net CPUE of white bass was 0.6/nn in 2011 (Figure 5), an all-time low for the past six surveys dating to 1990 (Appendix C). The historical catch rate has always been low. The entire sample was in the 14-inch group, and their relative weight was fair with Wr's at 85 (Figure 5). Moss Reservoir may be unsuitable for white bass because of its small size and low prey base.

Black basses: Although caught in the 2006 survey, smallmouth bass were not collected from Moss Reservoir during the 2011 survey (Appendix C). Anecdotal information from anglers indicated smallmouth bass are still in the reservoir, but in low numbers.

The electrofishing CPUE of stock-length spotted bass was 34.0/h in 2010, about the same as the 35.0/h in 2006, but lower than 2002 (Figure 6). Size structure was similar to the past 3 surveys but there were no fish over 12 inches. The total CPUE of 50.0/h in 2010 was near the reservoir average of 52.6/h (Appendix C). Relative weights were near 90 for 7- to 11-inch fish (Figure 6).

The electrofishing total CPUE (47.0/h) for largemouth was the lowest on record and far below the reservoir average of 91.3/h. Also no fish were collected over 15 inches (Figure 7 and Appendix C). The 2006 total CPUE of 126.0/h was the highest on record. Young-of-the-year contributed most to the total catch rate. As evidenced by a PSD of 50 the size structure should be good, but the lack of fish over 15 inches indicated the sample population did not have preferred size bass for the anglers. Largemouth bass in Moss Reservoir reached 14 inches at 4 years (N = 5; range = 2 – 4 years). Body condition in 2010 was below the Wr range of 95-100 recommended by Anderson for nearly all size classes of fish (Figure 7).

White crappie: The trap net catch rate of white crappie was 7.2/nn in 2010 (Figure 8), by far the highest catch on record (Appendix C). The total CPUE for the past two surveys has been well above the reservoir average of 2.6/nn. The PSD was 75, which was higher than 2002, but below the PSD of 96 in 2006 (Figure 8). The CPUE of white crappie $\geq$ 10 inches (legal size) was 2.2/nn, which accounted for 31% of the total catch. Relative weights ranged from 80 to 100 with most inch groups in the 80's. White crappie grew to legal-size in 3 years (N = 14; range = 2 – 3 years).

Fisheries management plan for Moss Reservoir, Texas

Prepared – July 2011.

ISSUE 1: Information on the growth of largemouth bass was not conclusive because of low sample size. Ages of the current sample of 13- and 14 inch groups ranged from 2 to 4 years.

MANAGEMENT STRATEGIES

1. To increase the precision of estimating the age largemouth bass reach legal size of 14 inches, an additional collection in fall of 2011 should be conducted to collect at least 13 largemouth bass in the 13- and 14-inch groups.
2. Age a larger sample size to improve our findings in this report.

ISSUE 2: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant Salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the City of Gainesville to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule consists of mandatory monitoring in 2014-2015 (Table 5). An additional electrofishing sample will be conducted in fall 2011 to procure largemouth bass for supplemental age and growth information.

LITERATURE CITED

Aggus, L.R. and G.V. Elliott. 1975. Effects of cover and food on year-class strength of largemouth bass. Pages 317-322 *in* R.H. Stroud and H. Clepper, editors. Black bass biology and management. Sport Fishing Institute, Washington DC.

Anderson, R.O., and R.M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 *in* B.R. Murphy and D.W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional Size Distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7):348

DiCenzo, V.J., M.J. Maceina, and M.R. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Hysmith, B.T. and J.H. Moczygemba. 2007. Statewide freshwater fisheries monitoring and management program survey report for Moss Reservoir, 2006. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Texas Commission on Environmental Quality. 2008. Reservoir and lake use support assessment report. 15 pp.

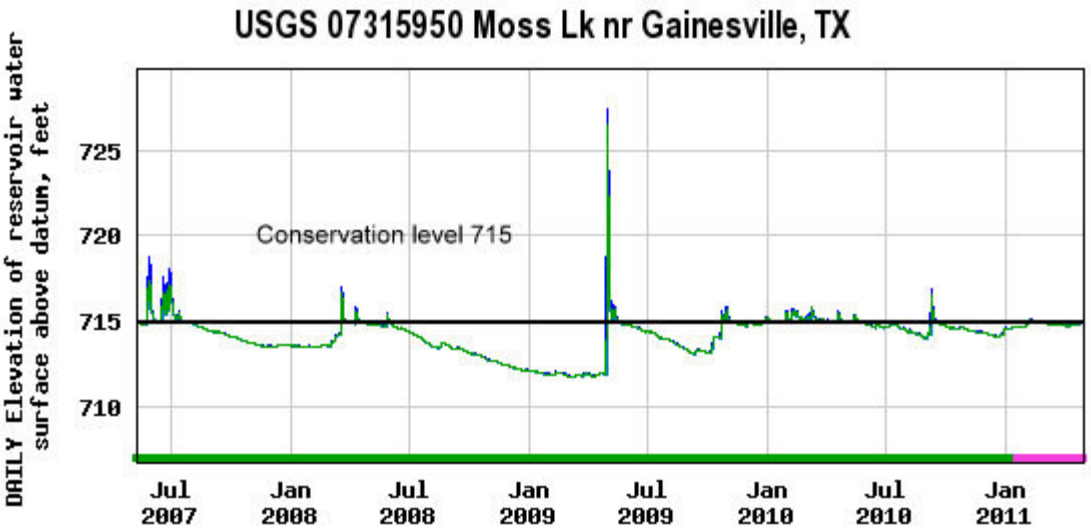


Figure 1. Monthly average water level elevations in feet above mean sea level (MSL) recorded for Moss Reservoir (U.S. Geological Survey. 2011. USGS real time water data for USGS 07315950 Moss Lake near Gainesville, Texas. http://waterdata.usgs.gov/nwis/dv), Texas, May 2007-April, 2011.

Table 1. Characteristics of Moss Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	City of Gainesville
County	Cooke
Reservoir type	Offstream
Shoreline development index	3.43
Conductivity	255 µmhos/cm

Table 2. Harvest regulations for Moss 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, smallmouth		14 minimum
Bass, spotted	5 (black bass in any combination)	No Limit
Bass, largemouth		14 minimum
Crappie: white and black crappie, their hybrids and subspecies	25	10 minimum

Table 3. Stocking history of Moss Reservoir, 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	2008	118,276	FGL	3.1
	Total	118,276		
Florida Largemouth bass	1981	38,500	FGL	2.0
	1982	58,064	FGL	2.0
	2010	97	ADL	18.8
	Total	96,661		
Largemouth bass	1967	10,000	UNK	UNK
	1971	260,000	UNK	UNK
	Total	270,000		
Smallmouth bass	1985	13	ADL	16.0
	1986	22,080	FGL	2.0
	1987	22,300	FRY	1.0
	1988	56,304	FRY	0.5
	Total	100,697		
Threadfin shad	1984	1,170	AFGL	3.0
	1985	6,500	AFGL	2.0
	Total	7,670		
Walleye	1977	341,100	FRY	0.2
	1978	339,500	FRY	0.2
	1979	339,910	FRY	0.2
	Total	1,020,510		

Table 4. Survey of shoreline habitat and littoral and pelagic habitat types, Moss Reservoir, Texas, 2010. A linear shoreline distance (miles) and percent of total was recorded for each shoreline habitat type found. Surface area (acres) and percent of total was determined for each type of littoral and pelagic habitat type found.

	Shoreline distance		Surface area	
	Miles	% of total	Coverage (acres)	% of total
Shoreline habitat type				
Bulkhead	2.0	12.5		
Rocky shoreline	10.2	63.7		
Natural shoreline	3.8	23.8		
Littoral and pelagic habitat type				
Standing timber, stumps			71	6.2
Exotic not-prohibited[a]			1	0.1
Native emergent[b]			8.5	0.7
Native floating leaved – Floating[c]			0.1	<0.1
Native submersed[d]			57.8	5.1
Hydrilla			<0.1	<0.1
Open water			998.6	87.5
Piers, boat docks, marinas			3	0.3

[a] Yellow floating-heart
[b] Water-willow & Common cattail
[c] American lotus
[d] Muskgrass & Pondweed

Gizzard Shad

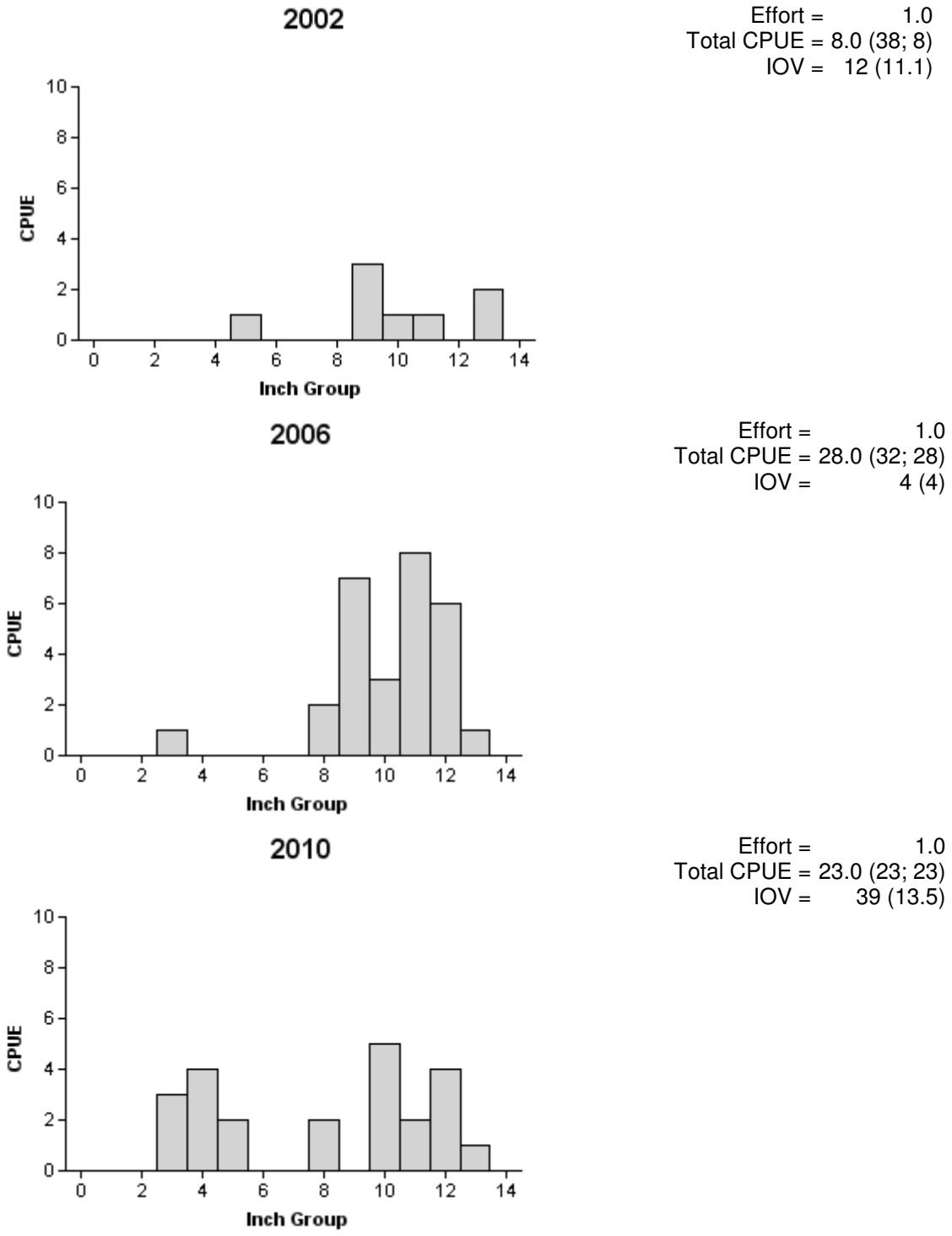


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas 2002, 2006, and 2010.

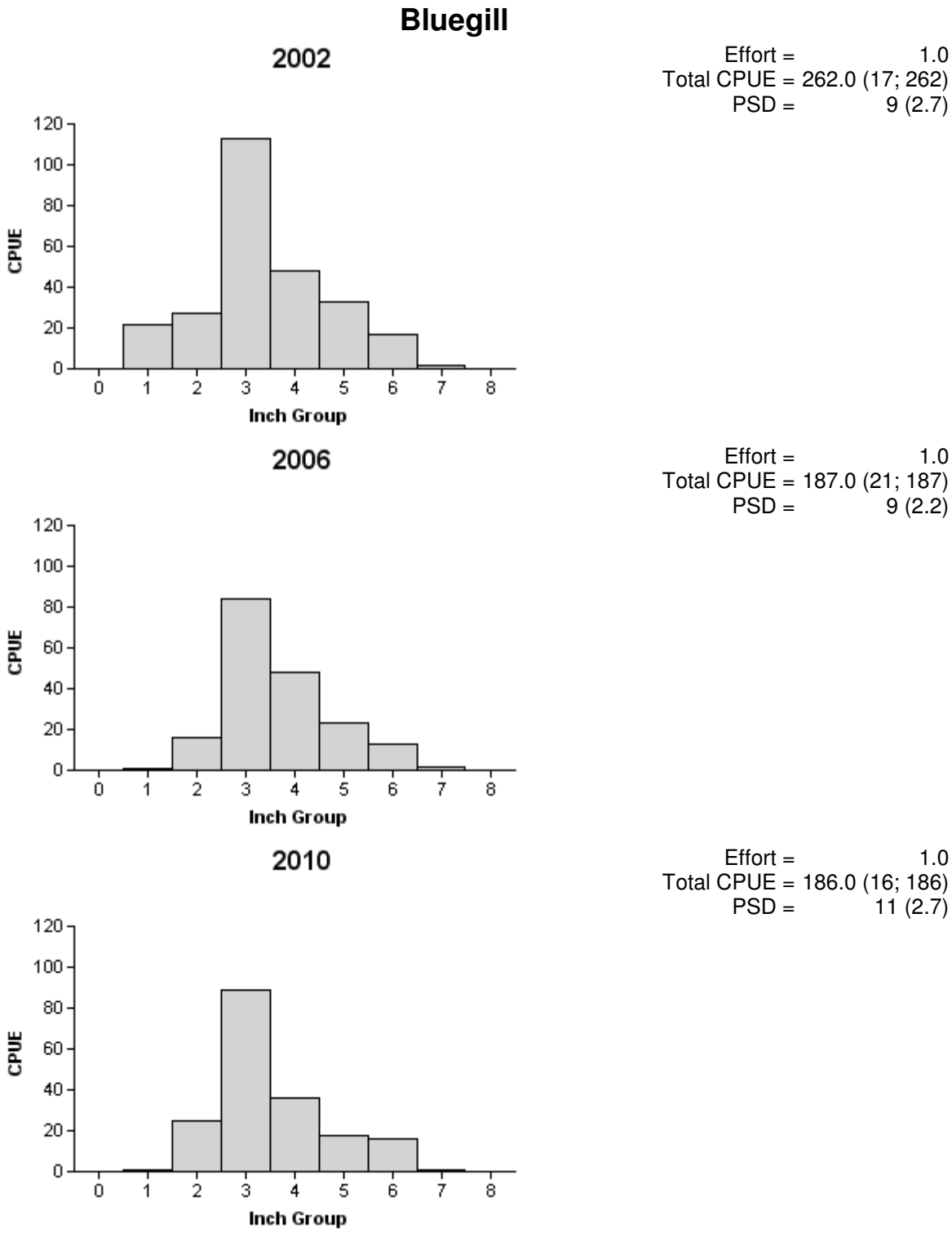


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2002, 2006, and 2010.

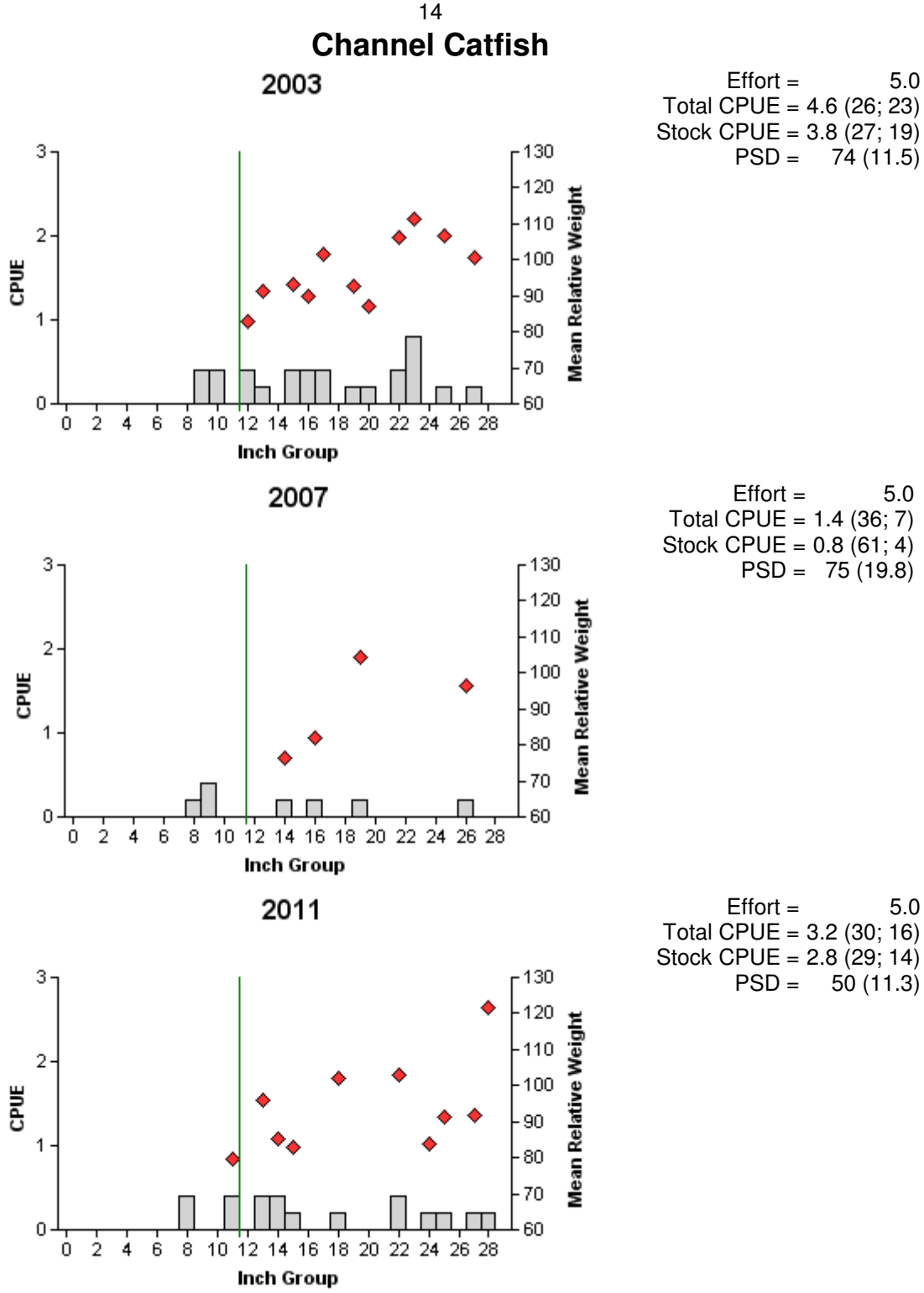


Figure 4. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 2003, 2007, and 2011. Vertical lines represent length limit at time of collection.

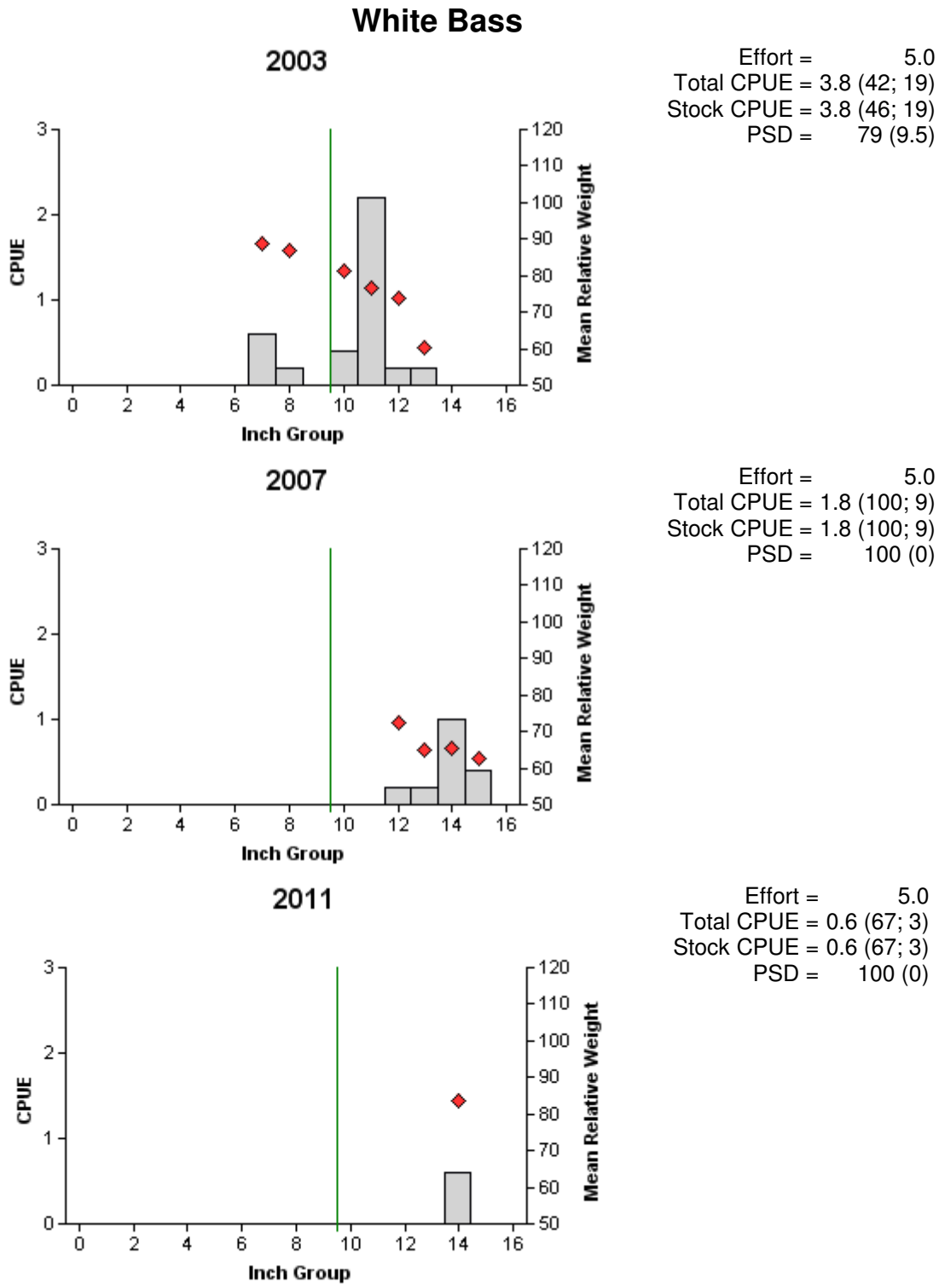


Figure 5. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 2003, 2007, and 2011. Vertical lines represent length limit at time of collection.

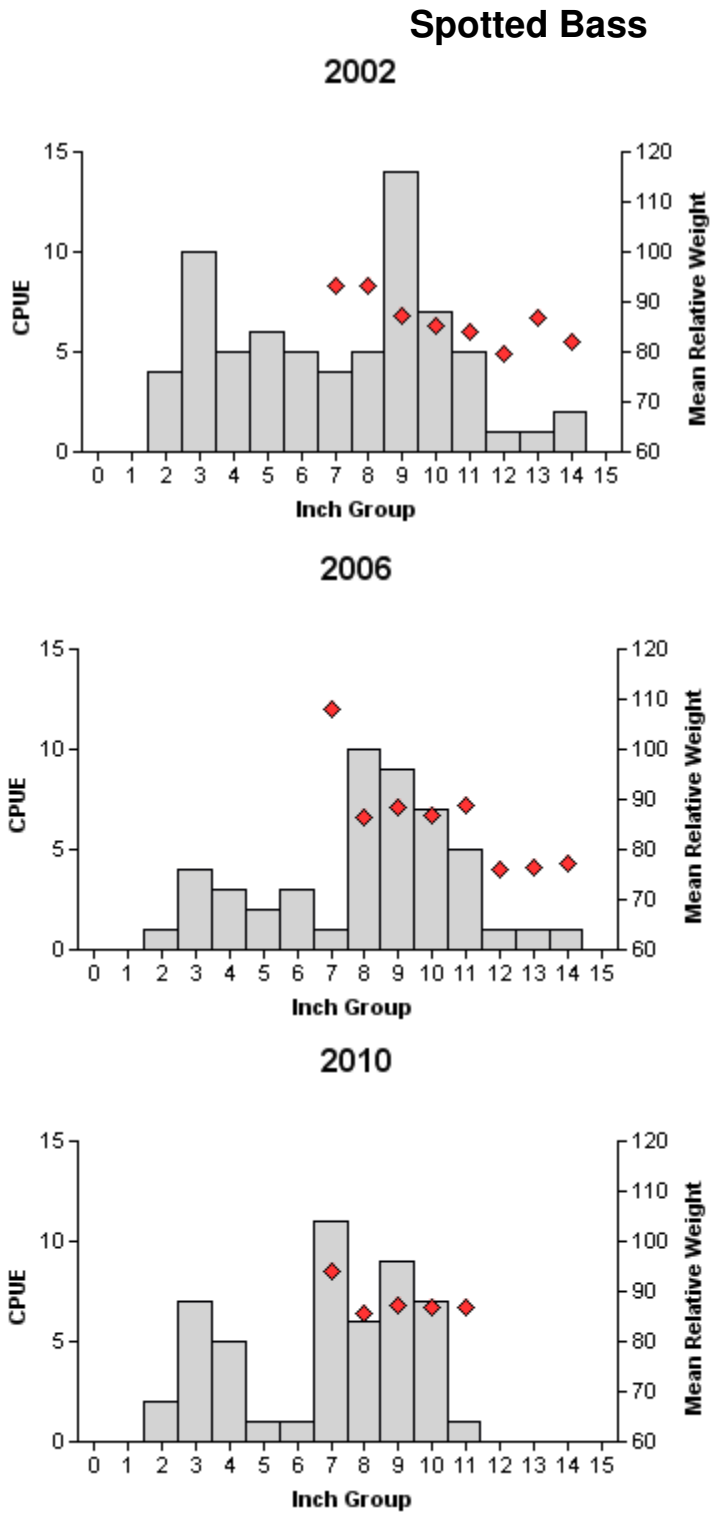


Figure 6. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2002, 2006, and 2010.

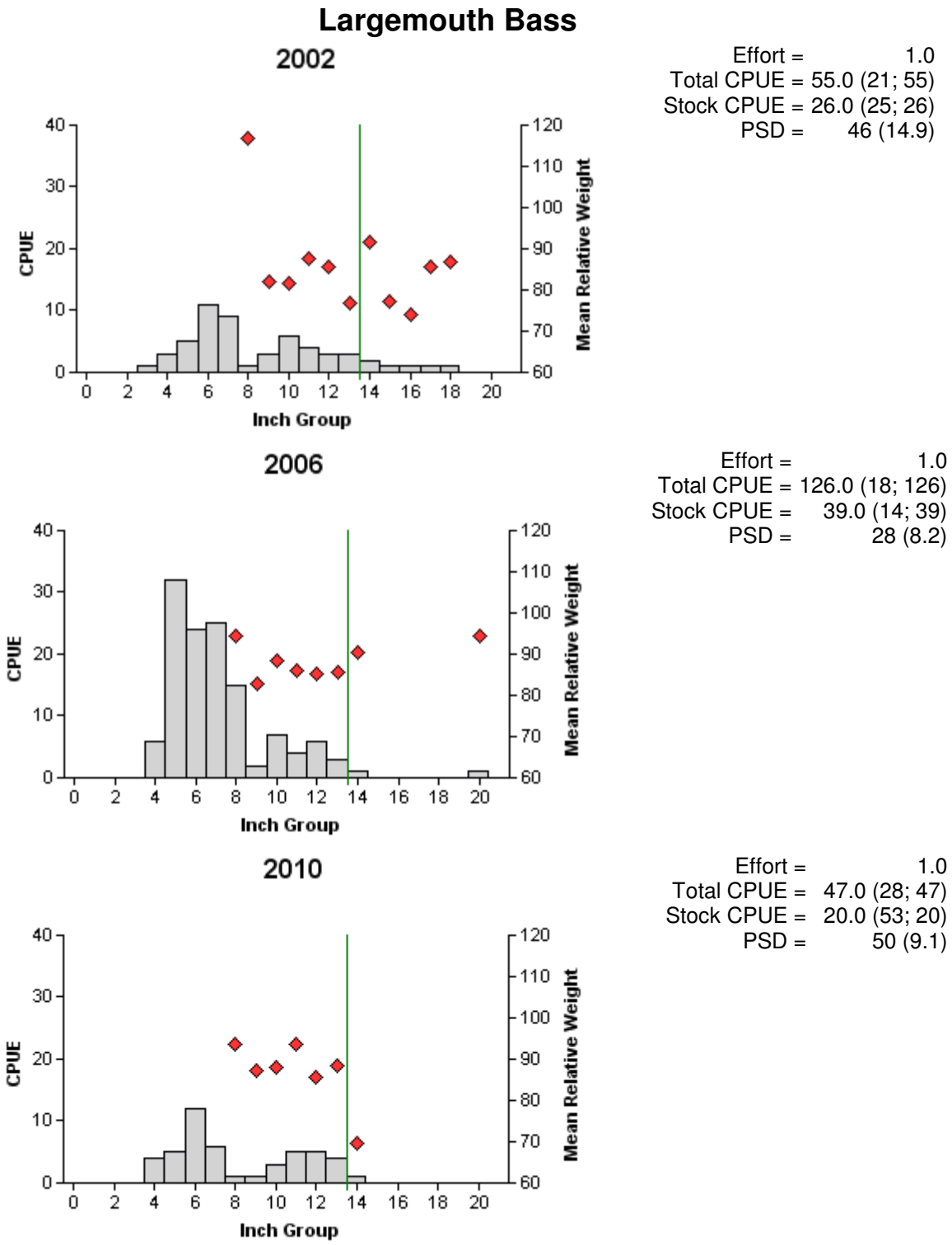


Figure 7. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2002, 2006, and 2010. Vertical lines represent length limit at time of collection.

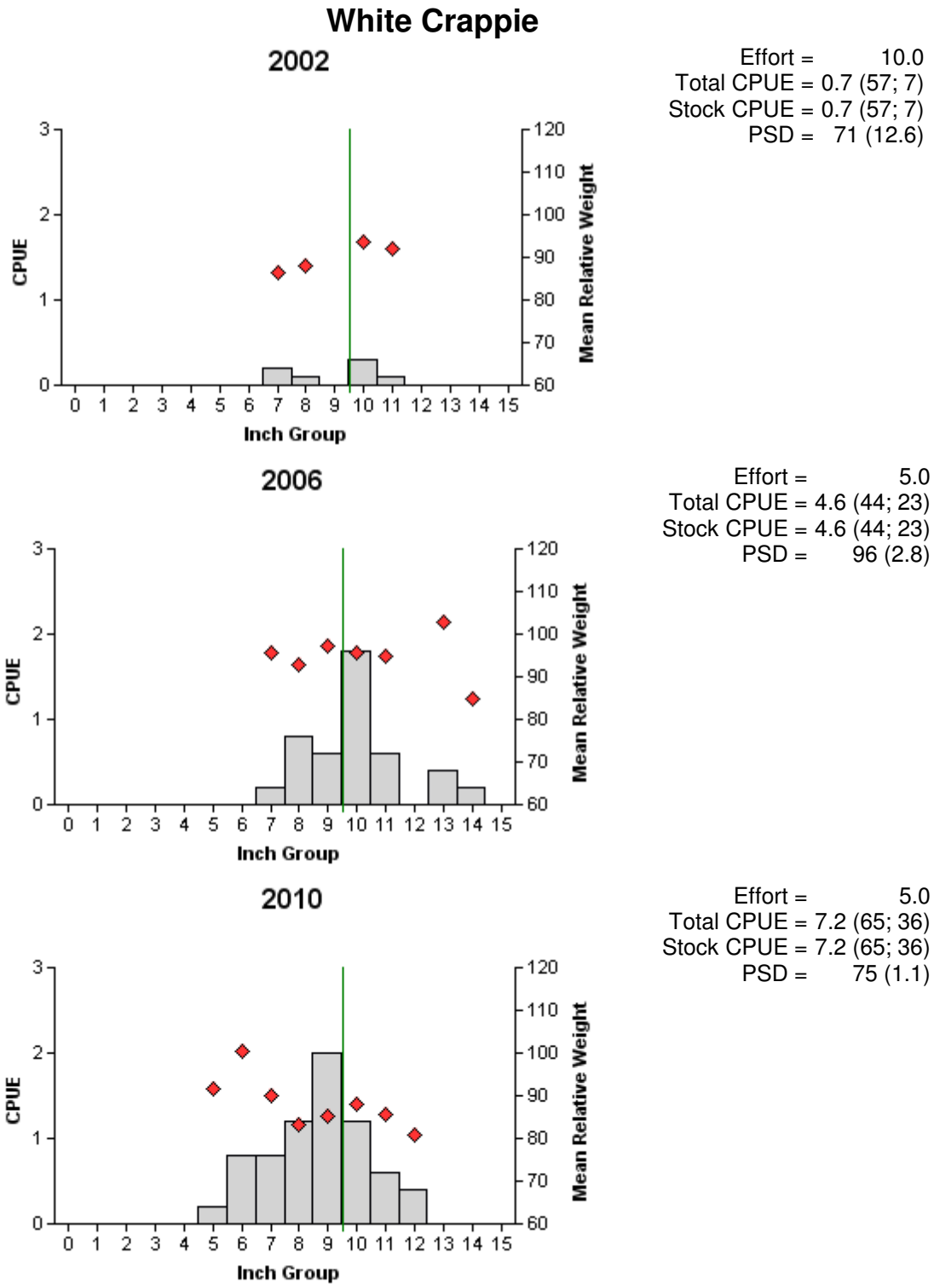


Figure 8. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Moss Reservoir, Texas, 2002, 2006, and 2010. Vertical lines represent length limit at time of collection.

Table 5. Proposed sampling schedule for Moss Reservoir, Texas. Electrofishing and trap netting surveys are conducted in the fall, while gill netting surveys are conducted during the following spring. Standard survey denoted by S. Additionally (A) an electrofishing survey will be conducted in fall 2011.

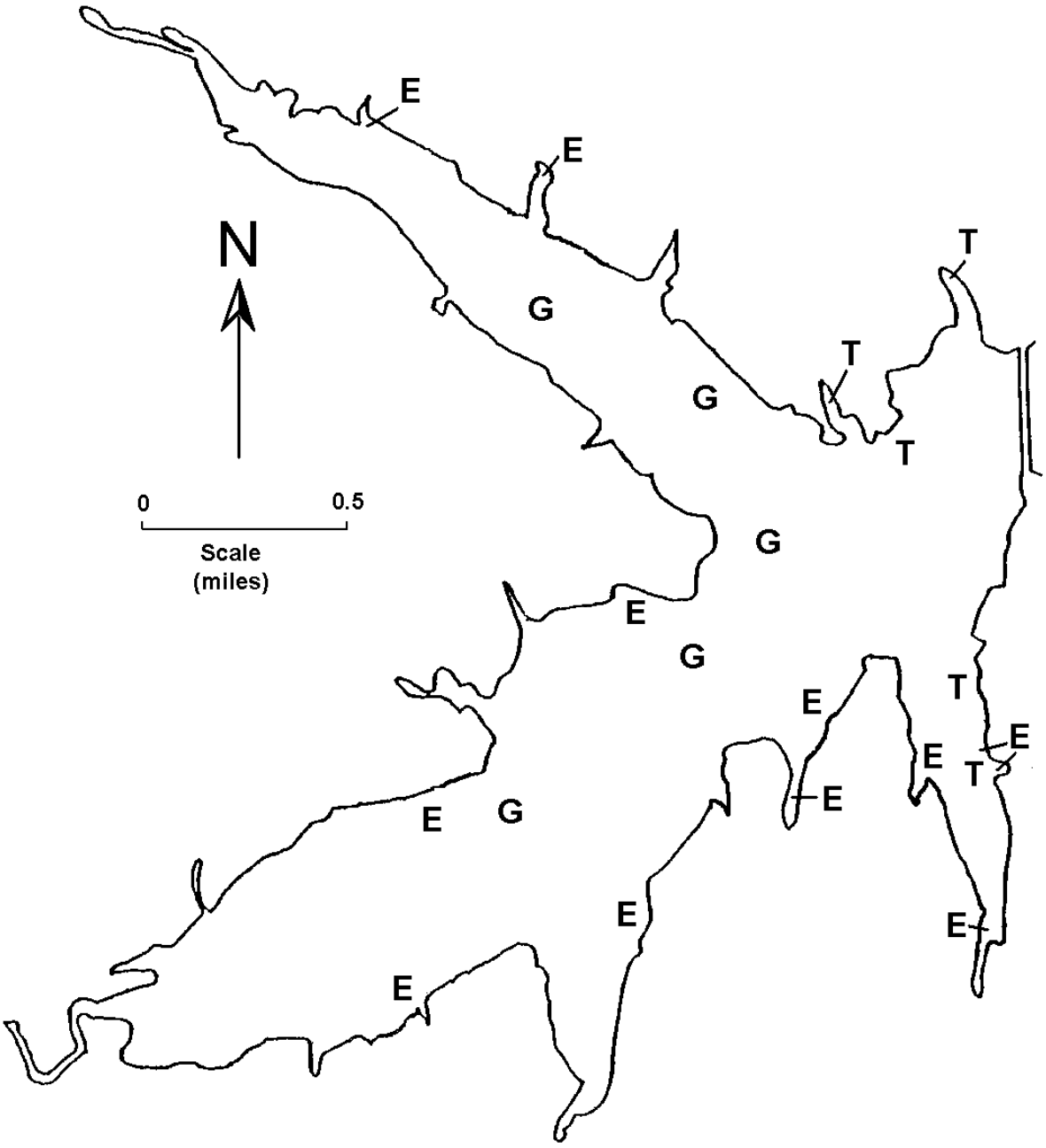
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Vegetation Survey	Access Survey	Report
Fall 2011-Spring 2012	A						
Fall 2012-Spring2013							
Fall 2013-Spring 2014							
Fall 2014-Spring 2015	S	S	S		S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Moss Reservoir, Texas, 2010-2011.

	Gill Netting		Trap Netting		Electrofishing	
Species	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					23	23.0
Threadfin shad					3	3.0
Channel catfish	16	3.2				
White bass	3	0.6				
Green sunfish					8	8.0
Warmouth					15	15.0
Bluegill					186	186.0
Longear sunfish					46	46.0
Redear sunfish					22	22.0
Spotted bass					50	50.0
Largemouth bass					47	47.0
White crappie			36	7.2		

APPENDIX B



Location of sampling sites, Moss Reservoir, Texas, 2010-2011. Trap netting, gill netting, and electrofishing sampling stations are indicated by T, G, and E, respectively. Water level was 0.5 feet below conservation for trap netting and electrofishing and 0.25 feet below during gill netting.

APPENDIX C

Historical catch rates of targeted species by gear type for Moss Reservoir, Texas, 1990, 1994, 1997, 2002, 2003, 2006, 2007, 2010, and 2011.

		Year									
Gear	Species	1990[a]	1994[a]	1997[b]	2002[b]	2003[b]	2006[b]	2007[b]	2010[b]	2011[b]	**Avg.**
Gill Netting	Channel catfish	11.0	6.6	3.8		4.6		1.4		3.2	**5.1**
(fish/net night)	White bass	1.8	3.6	2.0		3.8		1.8		0.6	**2.3**
Electrofishing	Gizzard shad	43.0	20.0	36.0	8.0		28.0		23.0		**26.3**
(fish/hour)	Threadfin shad	273.0	32.0	0.6	7.0		173.0		3.0		**81.4**
	Green sunfish	81.0	32.0	19.3	18.0		6.0		8.0		**27.4**
	Warmouth	18.0	24.7	7.3	23.0		10.0		15.0		**16.3**
	Bluegill	289.0	304.7	187.3	262.0		187.0		186.0		**236.0**
	Longear sunfish	94.0	28.0	18.7	53.0		31.0		46.0		**45.1**
	Redear sunfish	28.0	29.3	19.3	18.0		18.0		22.0		**22.4**
	Smallmouth bass	5.0	0.0	0.0	0.0		2.0		0.0		**1.2**
	Spotted bass	73.0	40.7	34.7	69.0		48.0		50.0		**52.6**
	Largemouth bass	117.0	108.7	94.0	55.0		126.0		47.0		**91.3**
Trap Netting	White crappie	0.8	1.8	0.4	0.5		4.6		7.2		**2.6**
(fish/net night)											

[a] All sampling stations for all gear were subjectively selected.
[b] All sampling stations for all gear were randomly selected.