

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

**Amon G. Carter Reservoir**

*Prepared by:*

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

Inland Fisheries Division  
District 2-A, Pottsboro, Texas



Carter Smith  
Executive Director

Gary Saul  
Director, Inland Fisheries

July 31, 2013

## TABLE OF CONTENTS

Survey and Management Summary.....	2
Introduction.....	3
Reservoir Description.....	3
Angler Access.....	3
Management History.....	3
Methods.....	3
Results and Discussion.....	4
Fisheries Management Plan.....	6
Literature Cited.....	7
Figures and Tables.....	8-26
Water Level (Figure 1).....	8
Reservoir Characteristics (Table 1).....	8
Boat Ramp Characteristics (Table 2).....	8
Harvest Regulations (Table 3).....	9
Stocking History (Table 4).....	10
Structural Habitat Survey (Table 5).....	11
Aquatic Vegetation Survey (Table 6).....	11
Percent Directed Angler Effort per Species (Table 7).....	12
Fishing Effort and Directed Expenditures (Table 8).....	12
Gizzard Shad (Figure 2).....	13
Bluegill (Figure 3).....	14
Channel Catfish (Figures 4 - 5; Table 9).....	15
White Bass (Figures 6 - 7; Table 10).....	17
Largemouth Bass (Figures 8 - 9; Tables 11 -13).....	19
White Crappie (Figures 10 - 11; Table 14).....	22
Black Crappie (Figures 12 - 13; Table 15).....	24
Proposed Sampling Schedule (Table 16).....	26
Appendix A: Catch Rates for all Target Species from all Gear Types.....	27
Appendix B: Map of 2012-2013 Sampling Locations.....	28
Appendix C: Historical Catch Statistics 2002-2013.....	29

## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Amon G. Carter Reservoir were surveyed in 2012 using electrofishing and trap netting and in 2013 using gill netting. Habitat was surveyed in 2012. Anglers were surveyed from September 2010- August 2011. Historical data are presented with the 2012-2013 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Amon G. Carter Reservoir is a 1,848-acre impoundment on Big Sandy Creek in Montague County. Water level was below conservation level (920 ft-msl) the majority of the time from May 2009 until April 2013. The reservoir waters are moderately rich in nutrients. Habitat features consisted of rocky shoreline, standing timber, native submersed aquatic vegetation, Eurasian water-milfoil, and hydrilla.
- **Management History:** Important sport fish include Channel Catfish, Flathead Catfish, White Bass, Largemouth Bass, and Crappie. Management recommendations included an investigation to find a best-fit Largemouth Bass regulation using age and growth data, conduct creel survey, conduct a public scooping meeting, monitor growth of hydrilla, and execute updates of angler information. An estimated 485,761 Florida Largemouth Bass were stocked from 1982 – 1985, 2000, and 2001.
- **Fish Community**
  - **Prey species:** Electrofishing catch rate of Gizzard Shad was the second lowest on record, but was augmented by high abundance of Threadfin Shad. The relative abundance of prey-size Gizzard Shad ( $\leq 7$ -inches) was the lowest on record. Electrofishing catch rate of Bluegill remained excellent.
  - **Channel Catfish:** Gill net catch rate of Channel Catfish was fair; lower than the 10-year average. Most of the population was legal size and in good condition. Recruitment of legal-size fish was excellent since the entire sample population was  $\geq 12$  inches. Anglers harvested an estimated 8,265 Channel Catfish.
  - **White Bass:** Gill net catch rate of White Bass was high. One half of the catch was legal-size and body condition was good. Recruitment of legal-size fish was excellent. Anglers harvested an estimated 1,986 White Bass.
  - **Largemouth Bass:** Electrofishing catch rate of Largemouth Bass was above the historical average. Recruitment of legal-size fish has increased. Recruitment of young fish was excellent. Florida Largemouth Bass genetic influence was high. Condition and growth were good. Angler harvest was high in 2010-11. Tournament anglers weighed-in 4,245 fish in 2010-11.
  - **Crappie:** Trap net catch rate of White Crappie surpassed the historical average. The legal-size catch increased. Recruitment, growth, and condition were good. Anglers harvested an estimated 31,466 White Crappie.

Trap net catch rate of Black Crappie increased since 2008. Recruitment and condition were good; growth was fair. Anglers harvested an estimated 7,769 Black Crappie.
- **Management Strategies:** Based on current information, Amon G. Carter Reservoir should continue to be managed with existing harvest regulations. A bass-only electrofishing survey will be conducted in 2014 to monitor the Largemouth Bass size structure. The City of Bowie will be informed about new exotic species threats to Texas waters, and work with them to display appropriate signage and educate constituents. General monitoring with electrofisher, trap nets, and gill nets will be conducted in 2016-2017.

## INTRODUCTION

This document is a summary of fisheries data collected from Amon G. Carter Reservoir in 2012–2013. Anglers were surveyed from September 2010 to August 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 2012–2013 data for comparison.

### *Reservoir Description*

Amon G. Carter Reservoir is a 1,848-acre impoundment on Big Sandy Creek in Montague County. It was constructed in 1956 by the City of Bowie for municipal and industrial uses. The reservoir drains approximately 111 square miles and has a shoreline of 22.5 miles. Approximately 55% of the reservoir is  $\leq 15$  feet deep. Water level was below conservation level (920 ft-msl) most of the time from June 2009 until May 2013 (Figure 1). With a TSI chl-*a* of 45.18, Amon G. Carter Reservoir was mesotrophic and borderline eutrophic (Texas Commission on Environmental Quality 2011). A TSI chl-*a*  $>45$  and  $<55$  is considered eutrophic; hence, the reservoir is moderately rich in nutrients with moderate productivity. The average depth is 13 feet with a maximum depth of 50 feet. Habitat features consisted mainly of rip-rap, rocky shoreline, boulders, native submersed aquatic vegetation, dead standing timber, and a few boat docks. Other descriptive characteristics for Amon G. Carter Reservoir are in Table 1.

### *Angler Access*

Boat access consisted of two public boat ramps with parking, boarding pier, and ample illumination (Table 2). Selma Park, owned by the City of Bowie, provides angler access to a mile of shoreline, as well as two fishing piers. The rest of the public bank access is adjacent to the south boat ramp, off FM1125. Further information about Amon G. Carter Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Department (TPWD) web site at [www.tpwd.state.tx.us](http://www.tpwd.state.tx.us) and navigating within the fishing link.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Hysmith and Moczygemba 2009) included:

1. Determine the best fisheries management strategy after the tournament exploitation of Largemouth Bass study has been analyzed.

**Action:** Largemouth Bass harvest regulations were left at the statewide regulation.

**Harvest regulation history:** Sport fishes in Amon G. Carter Reservoir are currently managed with statewide regulations (Table 3).

**Stocking history:** Amon G. Carter Reservoir was last stocked with fingerling ShareLunker Largemouth Bass in 2013. The complete stocking history is in Table 4.

**Vegetation/habitat management history:** Habitat features at Amon G. Carter consisted mainly of rocky shoreline, standing timber, native submersed aquatic vegetation, and non-native Eurasian water-milfoil and hydrilla; and a few boat docks (Tables 5 & 6).

**Water transfer:** No inter-basin transfers are known to exist.

## METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations), gill netting [5 net nights (nn) at 5 stations], and trap netting (5 nn 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 2011).

A roving creel survey was conducted from September 2010 through August 2011. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Size Distribution (PSD)] as defined by Guy et al. (2007) and condition indices [relative weight ( $W_r$ )] 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 for creel statistics and SE was calculated for structural indices and IOV. Otoliths, for aging Largemouth Bass, White Crappie and Black Crappie, were analyzed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Ages were determined using Tier 2 protocol according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). The manual specifies procedures for Largemouth Bass only, but we adapted the protocol to other target fishes for identifying the number and size(s) of target fish to sample. The source for water level data was the United States Geological Survey website.

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2012 and by electrophoresis for previous years.

## RESULTS AND DISCUSSION

**Habitat:** Littoral zone habitat consisted primarily of rocky shoreline, standing timber, native submersed aquatic vegetation, Eurasian water-milfoil, hydrilla, and a few boat docks (Tables 5-6). Another non-native species, spiny leaf pondweed (*Najas minor*), was observed for the first time in small amounts in the lower area of the lake. There is not any problematic aquatic vegetation at this time.

**Creel Survey:** Tournament Largemouth Bass fishing 2010-2011 was similar to 2007-2008. Crappie fishing became a larger part of the total fishing effort at Amon G. Carter Reservoir in 2010-2011. Total directed angler effort for all species and total directed expenditures are presented in Tables 7 and 8.

**Prey species:** Electrofishing CPUE of Gizzard Shad and Bluegill were 91.0/h and 522.0/h, respectively (Figures 2 and 3). The catch rate of Gizzard Shad was higher than the rate observed in 2008 (Appendix C). However, index of vulnerability (IOV) for Gizzard Shad indicated only 15% of Gizzard Shad were available to existing predators, which was a large decrease from the 50% observed in 2008 (Figure 2). Bluegill  $\leq 4$  inches represented 46% of the sample population with a PSD of 25 (Figure 3). Total CPUE for Threadfin Shad was 2060.0/h, which was an all-time record and served to augment the prey base (Appendix C).

**Channel Catfish:** Gill net CPUE of Channel Catfish was 3.4/nn, which was similar to 2005 (Figure 4) and near historic average (Appendix C). Relative weights ranged from 78 to 112 with only two inch classes below 90. The sample population was comprised of fish 12 inches and longer. The third most sought-after sportfish (Table 7), anglers harvested an estimated 8,265 Channel Catfish (Table 9), which was more than double the harvest estimated during the 2007-2008 creel. The average size harvested was 17 inches, a 3-inch increase over the 14-inch observed in 2007-2008. Non-compliance of harvest regulations was observed (Figure 5).

**White Bass:** Gill net CPUE of White Bass was 22.4/nn (Figure 6), highest on record (Appendix C). An estimated 82% of the sample population was  $\geq 10$  inches, recruitment was evident, and relative weight was good. White Bass were not found in Amon G. Carter Reservoir until 1995 (Appendix C). Anglers harvested an estimated 5,482 White Bass with an average length of 12 inches (Figure 7). Total CPUE was 2.22 (Table 10).

**Largemouth Bass:** Electrofishing CPUE for Largemouth Bass (113.0/h) improved since 2008 (Figure 8). However a supplemental survey in 2010 showed a decrease in the CPUE for young-of-the-year, causing a lower overall catch rate. The stock CPUE and PSD have increased each year since 2008, which indicates an improvement in the Largemouth Bass size structure. Relative weight was good suggesting healthy fish. Largemouth Bass grew 14 inches in 2-3 years (N = 13). Largemouth Bass was the most sought-after sportfish (Table 7). Anglers harvested an estimated 5,012 Largemouth Bass (Table 11) of which 4,245 were tournament-held (catch and release; Table 12). They had an average length of 15.2 inches (Figure 9). Total catch per hour was 0.99 (Table 11).

Based on DNA analysis for 25 Largemouth Bass collected in the fall of 2012, the sample population is now represented genetically by 48.0% Florida Largemouth Bass alleles and 4.0% pure Florida Largemouth Bass. A pure Florida Largemouth Bass (13.75 pounds) was caught by an angler in spring of 2013. It was donated as the second ShareLunker from Amon G. Carter Reservoir.

Results from the Largemouth Bass exploitation study in 2007-2008 indicated a ratio of 8.3 tournament-caught to non-tournament-harvested (TCR/H) Largemouth Bass (unpublished data, TPWD). The 2010-2011 creel data exhibited a TCR/H ratio of 5.5. According to Allen et al. (2004), a ratio of three or greater could suggest problems with over-exploitation by tournament anglers.

**Crappie:** Trap net catch rate of White Crappie was 24.6/nn, a record catch rate (Figure 10 and Appendix C). Relative weights, averaging near 100, for White Crappie indicate they are in very good condition. Growth was very good with White Crappie reaching 10 inches in 1 year (N = 13; 1-2 years old). About 70% of the sample population was  $\geq 10$  inches. White Crappie was the second most sought-after sportfish (Table 7). Anglers harvested 31,456 White Crappie (Table 14), averaging 11 inches (Figure 11), although angler non-compliance was observed.

Trap net catch rate of Black Crappie was 3.0/nn, also a record catch rate (Figure 12 and Appendix C). Relative weights reflected good body condition. All the fish aged (N=13) were two years old and only two were  $\geq 10$  inches. Anglers harvested 7,769 Black Crappie (Table 15), averaging 10 inches (Figure 13). Angler non-compliance was observed.

## Fisheries management plan for Amon G. Carter Reservoir, Texas

Prepared – July 2013

**ISSUE 1:** An improvement in the Largemouth Bass size structure has been observed since 2008. Monitoring the continued improvement is important in the management of the fishery.

### MANAGEMENT STRATEGIES

1. Conduct a supplemental bass-only electrofishing survey in the fall of 2014.

**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 City of Bowie personnel to post appropriate signage at access points around the reservoir.
2. Contact and educate City of Bowie personnel about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their reservoir visitors.
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 a supplemental bass-only electrofishing survey in the fall of 2014 and mandatory monitoring in 2016-2017 (Table 16).

## LITERATURE CITED

- Allen, M.S., M.W. Rogers, R.A. Myers, and W.M. Bivin. 2004. Simulated impacts of tournament-associated mortality on Largemouth Bass fisheries. *North American Journal of Fisheries Management* 24: 1252-1261.
- 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*, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. *North American Journal of Fisheries Management* 16:888-895.
- Guy, C. S., R. M. Neuman, 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.
- Hysmith, B. T. and J. H. Moczygemba. 2009. Statewide freshwater fisheries monitoring and management program survey report for Amon G. Carter Reservoir, 2008. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- Texas Commission on Environmental Quality. 2011. Trophic classification of Texas reservoirs. 2010 Texas Water Quality Inventory and 303(d) List, Austin. 18 pp.

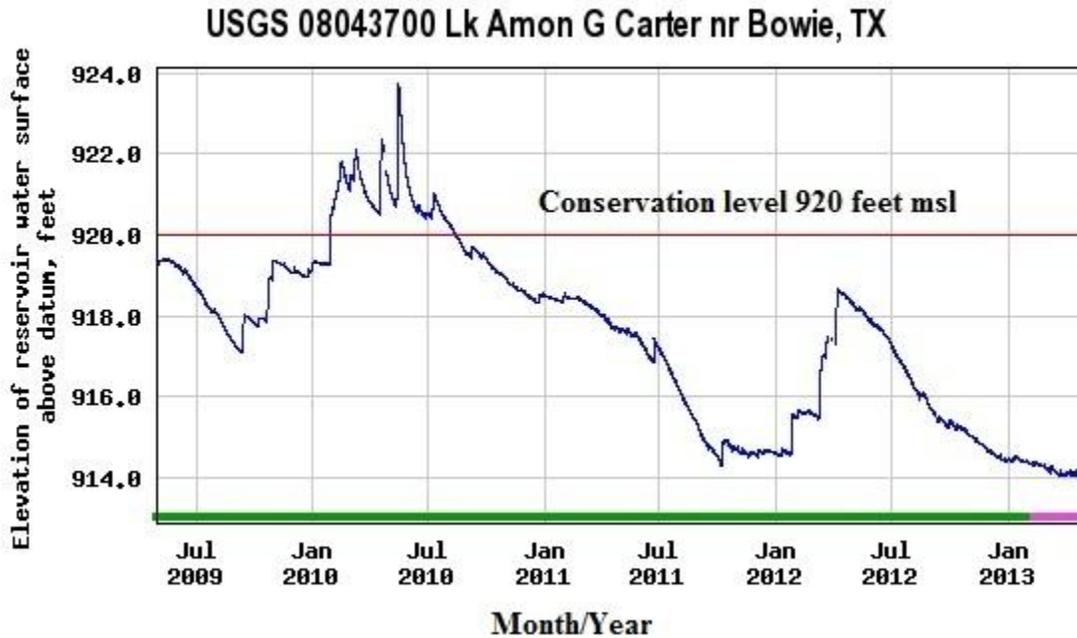


Figure 1. Monthly average water level elevations in feet above mean sea level (MSL) recorded for Amon G. Carter Reservoir, Texas, May 2009 - April 2013.

Table 1. Characteristics of Amon G. Carter Reservoir, Texas.

Characteristic	Description
Year constructed	1956
Controlling authority	City of Bowie
County	Montague
Reservoir type	Offstream
Shoreline Development Index	4.9
Conductivity	267-277 $\mu$ mhos/cm

Table 2. Boat ramp characteristics for Amon G. Carter Reservoir, Texas, October, 2012. Reservoir elevation at time of survey was 915 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Selma Park	33.4819 -97.8881	Y	20	910	Excellent Extension feasible.
FM 1125	33.4670 -97.8756	Y	40	910	Excellent Extension not feasible.

Table 3. Harvest regulations for Amon G. Carter Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 3. Stocking history of Amon G. Carter, 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.

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Life Stage</b>	<b>Mean TL (in)</b>
Channel Catfish	1966	8,000	AFGL	7.9
	1969	40,000	AFGL	7.9
	1970	25,000	AFGL	7.9
	1971	23,000	AFGL	7.9
	1972	5,000	AFGL	7.9
	Total	101,000		
Florida Largemouth Bass	1982	77,533	FGL	2.0
	1983	36,980	FGL	2.0
	1984	101,932	FGL	1.7
	1985	56,000	FRY	1.0
	2000	106,500	FGL	1.4
	2001	106,816	FGL	1.5
	Total	485,761		
Largemouth Bass	1971	75,000	UNK	UNK
	1985	60	ADL	10.4
	Total	75,060		
ShareLunker Largemouth Bass	2013	6,497	FGL	1.9
	Total	6,497		
Threadfin Shad	1978	800	AFGL	2.9
	1980	1,800	AFGL	2.9
	1984	1,500	AFGL	2.0
	1985	4,100	AFGL	2.0
	2003	925	ADL	4.0
	Total	9,125		

Table 5. Survey of structural habitat types, Amon G. Carter Reservoir, Texas, 2012. Shoreline habitat type units are in miles and standing timber and open water are in acres.

Habitat type	Estimate	% of total
Bulkhead and boat docks	0.6 miles	2.6
Gravel	2.4 miles	10.8
Natural shoreline	12.5 miles	55.5
Rock bluff	0.5 miles	2.2
Rocky shoreline	6.5 miles	28.9
Standing timber	556.8 acres	30.1
Open water	1291.2 acres	69.9

Table 6. Survey of aquatic vegetation, Amon G. Carter Reservoir, Texas 2012. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2012
Native submersed <sup>a</sup>	18.5 (1.0)
Native floating-leaved <sup>b</sup>	0.3 (1.3)
Native emergent <sup>c</sup>	1.3 (<0.1)
Non-native <sup>d</sup>	
Eurasian water-milfoil	<0.1 (<0.1)
Hydrilla	<0.1 (<0.1)
Spiny leaf pondweed	3.5 (0.2)

<sup>a</sup>Pondweed, bushy pondweed, and coontail.

<sup>b</sup>American lotus.

<sup>c</sup>Water willow and buttonbush.

<sup>d</sup>Non-native vegetation is a tier III level of concern where surveys are conducted once every four years.

Table 7. Percent directed angler effort by species for Amon G. Carter Reservoir, Texas, September 2010 – August 2011.

Species	Year 2007-2008	Year 2010-2011
Channel Catfish	16.5	14.0
White Bass	2.6	3.4
Sunfishes	1.6	1.0
Largemouth Bass	41.3 (24.0 tournament)	40.7 (18.3 tournament)
Crappie	16.8	27.0
Anything	21.2	13.8

Table 8. Total fishing effort (h) for all species and total directed expenditures at Amon G. Carter Reservoir, Texas, 2007-2008 and 2010-2011. Survey periods were from 1 December 2007 through 30 November 2008 and 1 September 2010 through 31 August 2011. Relative standard error is in parentheses.

Creel statistic	2007-2008	2010-2011
Total fishing effort	52,083 (10)	58,942 (18)
Total directed expenditures	\$347,523 (19)	\$367,371 (25)

## Gizzard Shad

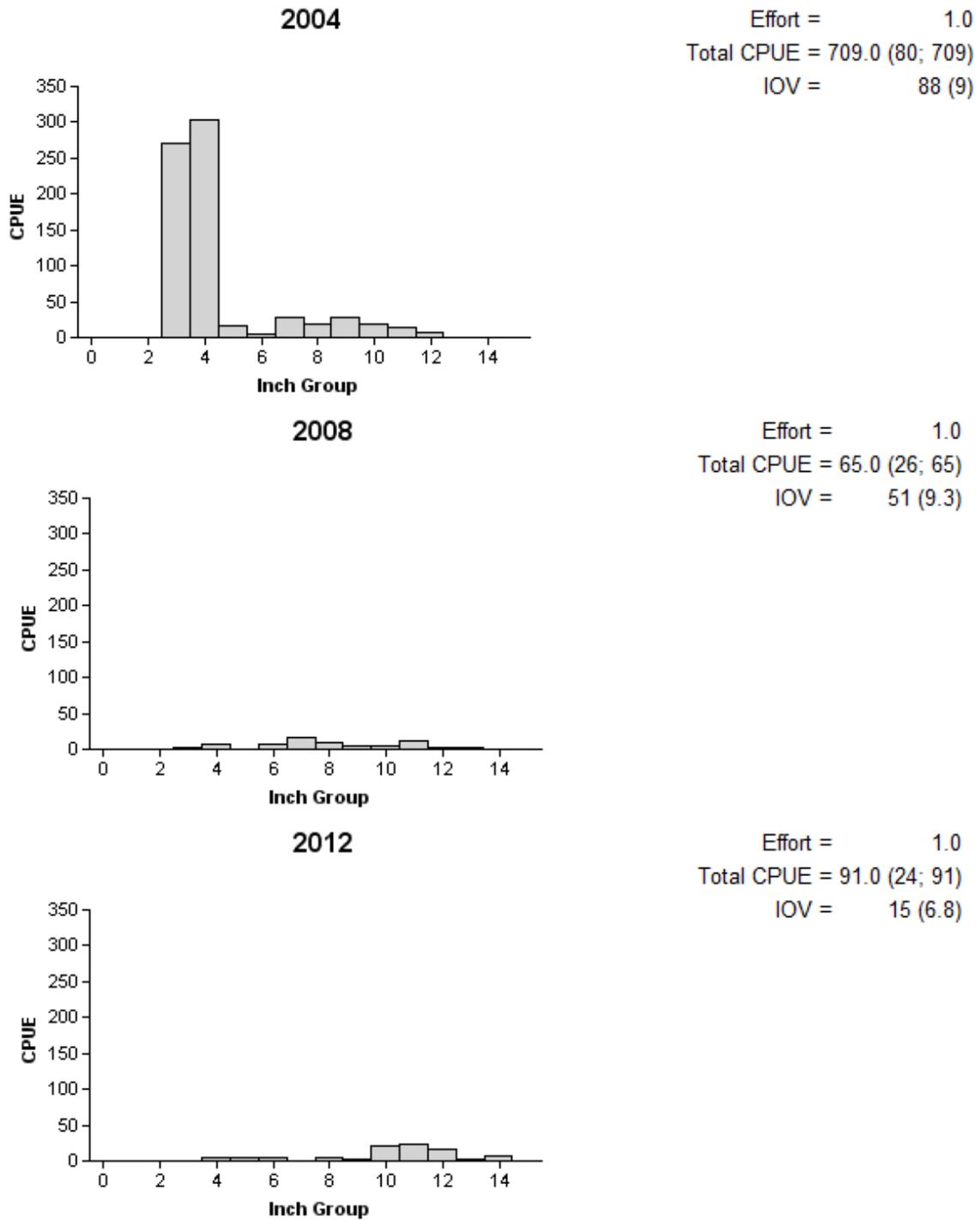


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Amon G. Carter Reservoir, Texas 2004, 2008, and 2012.

## Bluegill

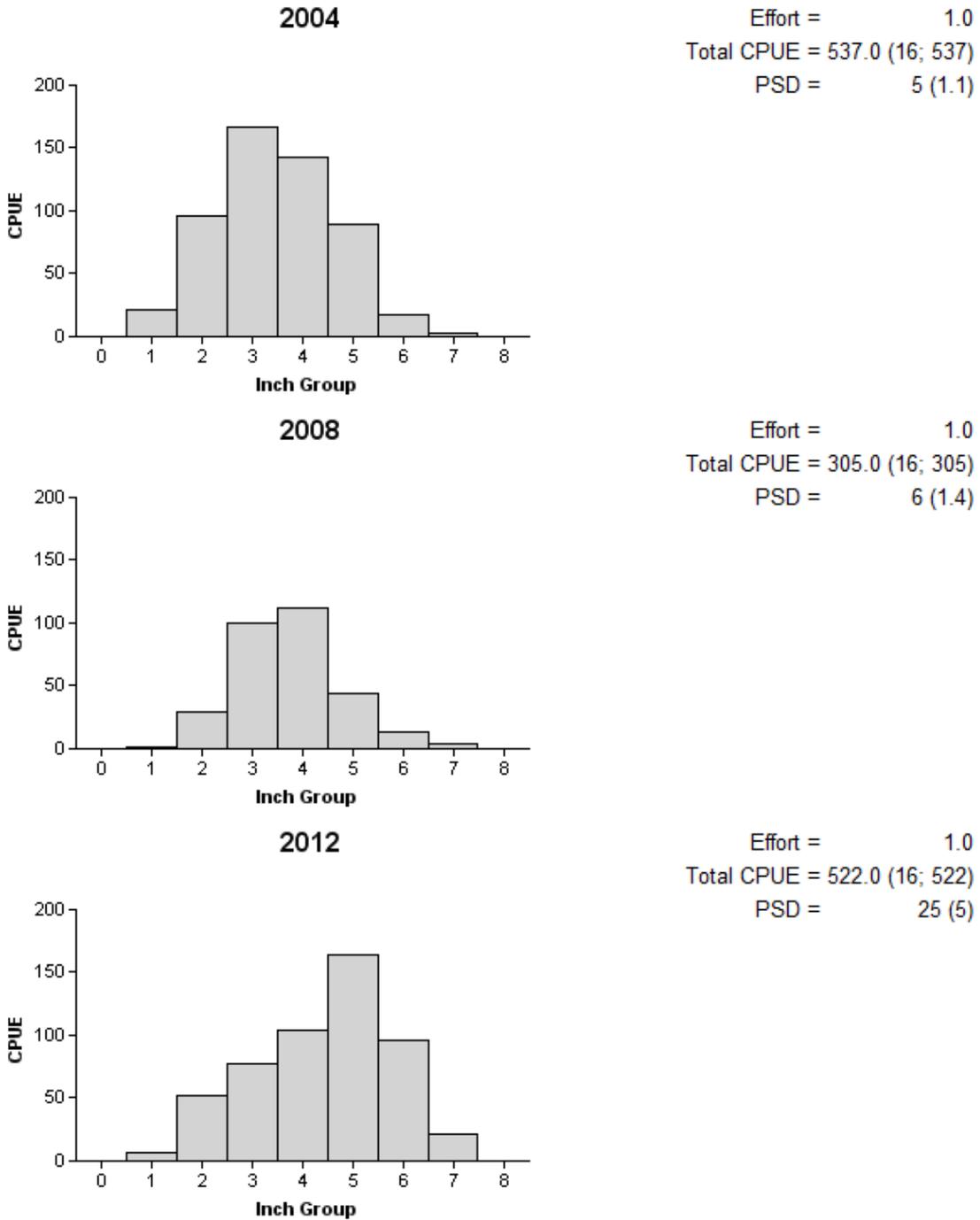


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Amon G. Carter Reservoir, Texas, 2004, 2008, and 2012.

## Channel Catfish

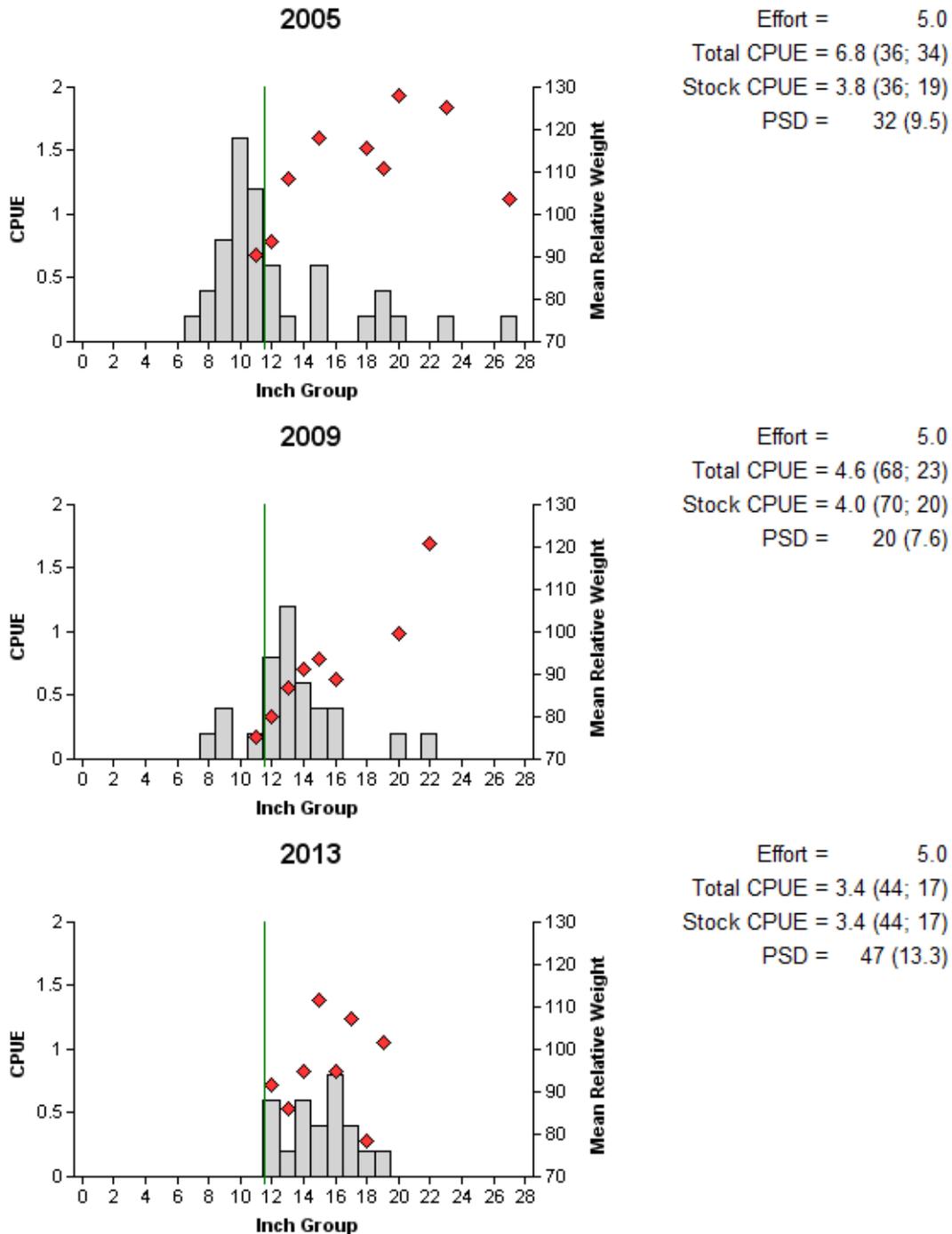


Figure 4. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Amon G. Carter Reservoir, Texas, 2005, 2009, and 2013. Vertical lines represent length limit at time of collection.

Table 9. Creel survey statistics for Channel Catfish at Amon G. Carter Reservoir from December 2007 - November 2008 and from September 2010 - August 2011, 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 are in parentheses.

Creel Survey Statistic	Year	
	2007-2008	2010-2011
Directed effort (h)	8,613.45 (15)	8,244.89 (20)
Directed effort(h)/acre	4.66 (15)	4.46 (20)
Total catch per hour	0.45 (42)	0.87 (71)
Total harvest	3,794.35 (34)	8,264.64 (50)
Harvest/acre	2.05 (13)	4.47 (50)
Percent legal released	6.23	37.02

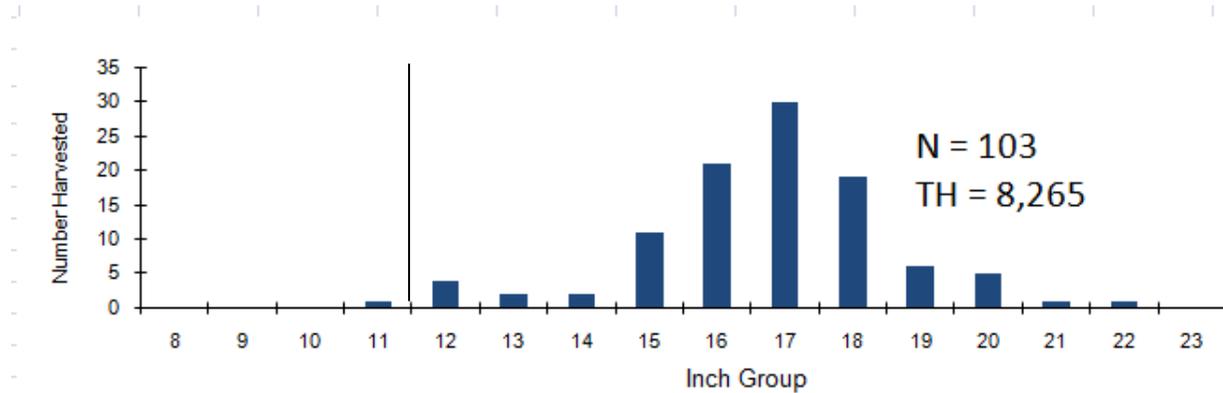


Figure 5. Length frequency of harvested Channel Catfish observed during creel surveys at Amon G. Carter Reservoir, Texas, September 2010 - August 2011, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

## White Bass

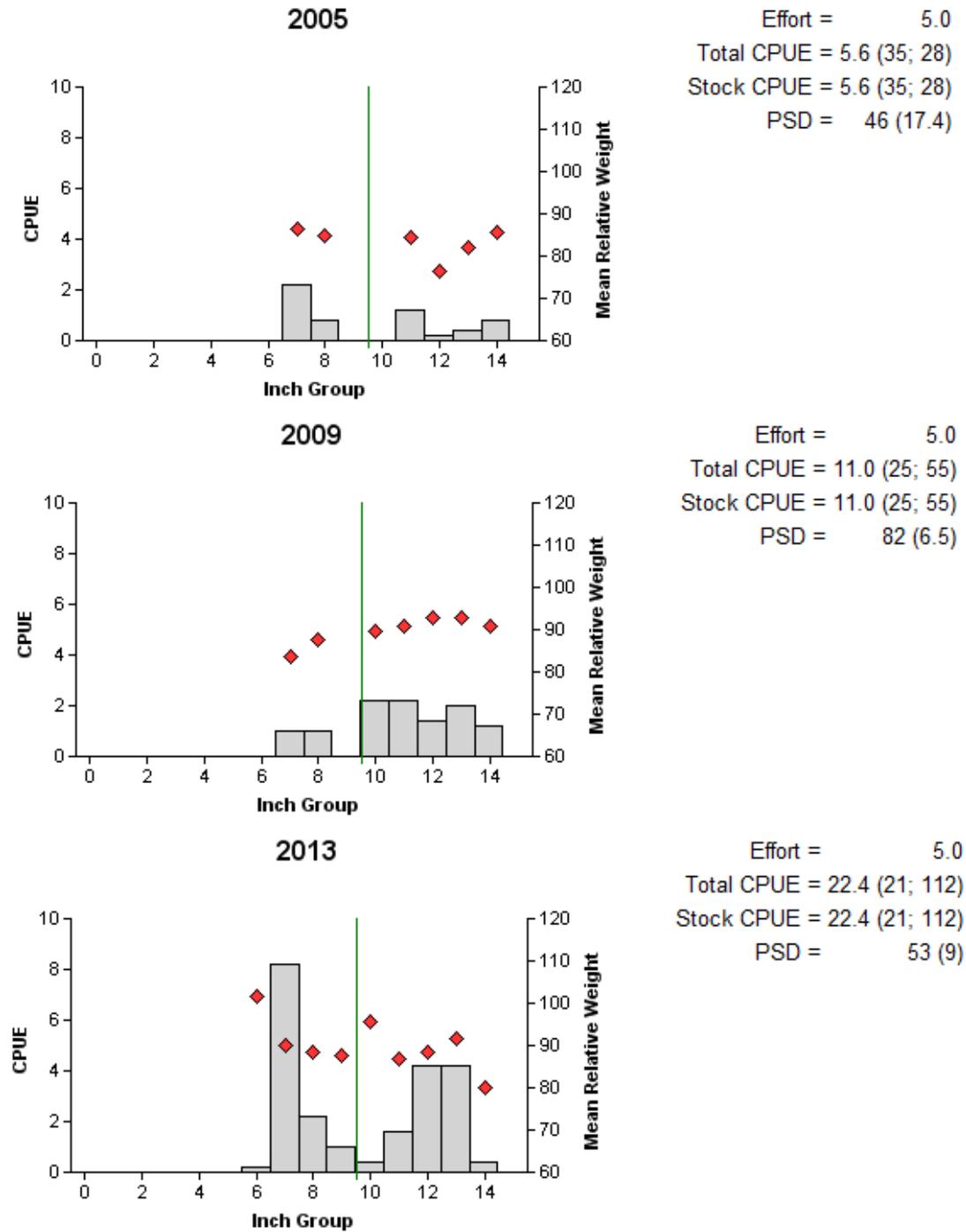


Figure 6. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Amon G. Carter Reservoir, Texas, 2005, 2009, and 2013. Vertical lines represent length limit at time of collection.

Table 10. Creel survey statistics for White Bass at Amon G. Carter Reservoir from December 2007 - November 2008 and from September 2010 - August 2011, 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.

Creel Survey Statistic	Year	
	2007-2008	2010-2011
Directed effort (h)	1,375.92 (31)	2,010.93 (39)
Directed effort(h)/acre	0.74 (31)	1.05 (39)
Total catch per hour	3.22 (54)	2.22 (88)
Total harvest	5,482.14 (28)	1,985.94 (70)
Harvest/acre	2.97 (28)	1.07 (70)
Percent legal released	27.04	51.30

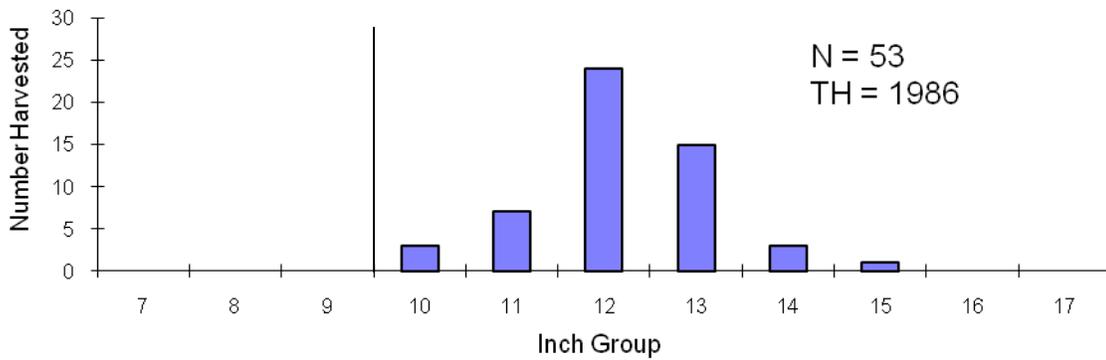


Figure 7. Length frequency of harvested White Bass observed during creel surveys at Amon G. Carter Reservoir, Texas, September 2010 - August 2011, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

## Largemouth Bass

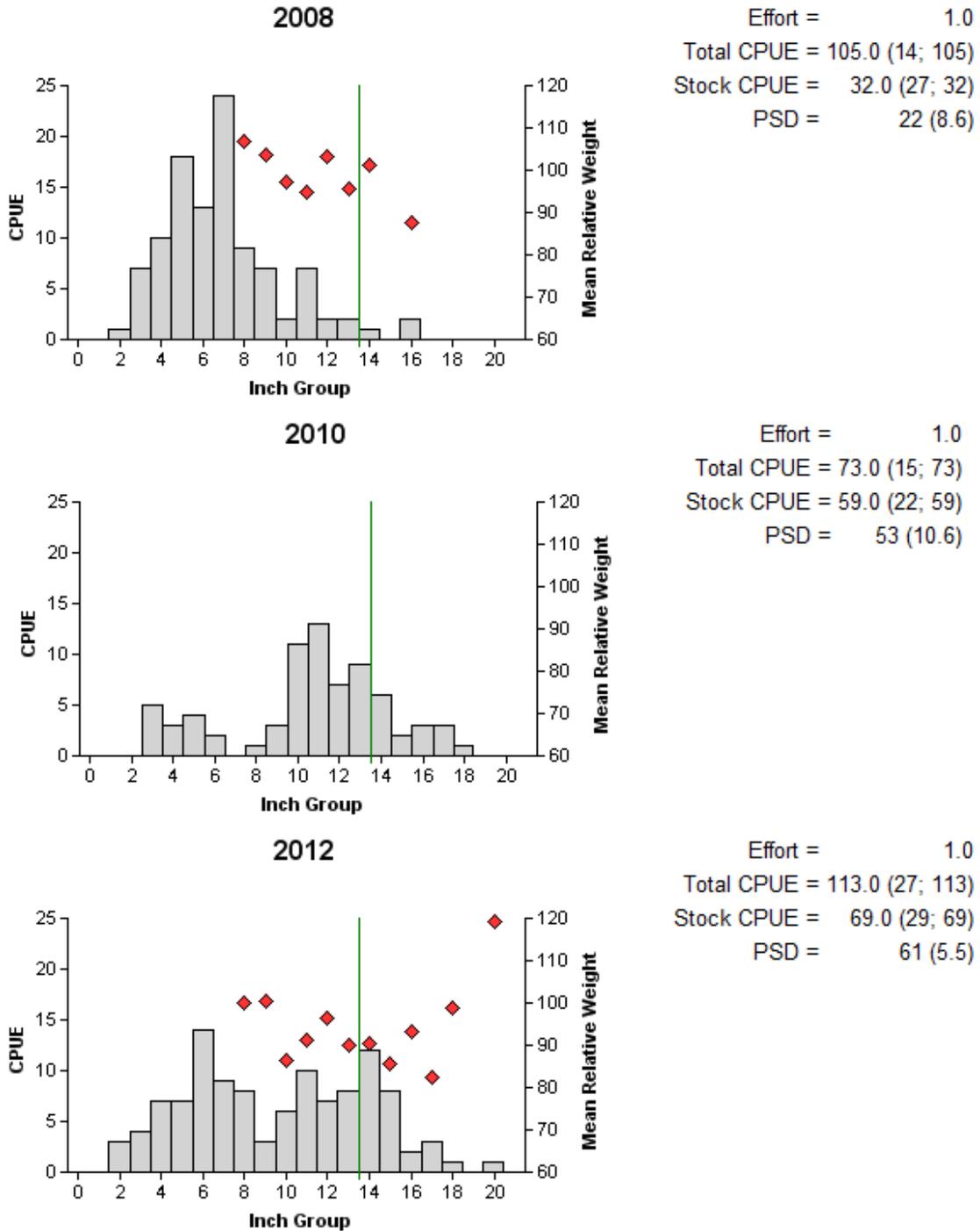


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Amon G. Carter Reservoir, Texas, 2008, 2010, and 2012. Vertical lines represent length limit at time of collection.

Table 11. Creel survey statistics for Largemouth Bass at Amon G. Carter Reservoir from December 2007 through November 2008 and September 2010 through August 2011, 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.

Creel Survey Statistic	Year	
	2007-2008	2010-2011
Directed effort (h)	21,511.52 (15)	24,037.97 (22)
Directed effort(h)/acre	11.64 (15)	13.01 (22)
Total catch per hour	0.60 (15)	0.99 (23)
Total harvest	2,810.76 (37)	5,011.80 (43)
Harvest/acre	1.52 (37)	2.71 (43)
Percent legal released	12.44	21.06

Table 12. Creel survey statistics (non-tournament[NT] and tournament[T]) for Largemouth Bass at Amon G. Carter Reservoir from December 2007 - November 2008 and September 2010 - August 2011, where total catch per hour is for anglers targeting Largemouth Bass and total harvest is the estimated number of Largemouth Bass harvested by non-tournament and tournament anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year			
	2007-2008		2010-2011	
	NT	T	NT	T
Directed effort (h)	9,007.14 (15)	12,504.37 (18)	13,223.64 (27)	10,814.33 (21)
Directed effort(h)/acre	4.87 (15)	6.77 (18)	7.16 (27)	5.85 (21)
Total catch per hour	0.48 (29)	0.70 (15)	0.85 (33)	1.10 (24)
Total harvest	250.08 (93)	2,191.62 (38)	766.64 (111)	4,245.16 (48)
Harvest/acre	0.14 (93)	1.19 (38)	0.41 (111)	2.30 (48)
Percent legal released	30.60	10.42	37.76	5.31

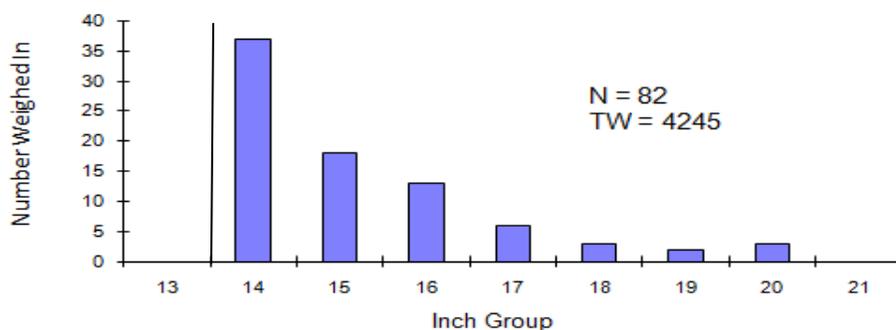


Figure 9. Length frequency of weighed-in tournament Largemouth Bass observed during creel surveys at Amon G. Carter Reservoir, Texas, September 2010 - August 2011, all anglers combined. N is the number of weighed-in tournament Largemouth Bass observed during creel surveys, and TW is the total estimated weighed-in tournament Largemouth Bass for the creel period. Vertical line represents length limit at time of creel survey.

Table 13. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Amon G. Carter Reservoir, Texas, 2002, 2004, and 2012. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2002	30	2	20	8	38.3	6.6
2004	30	3	25	2	56.7	10.0
2012	25	1	24	0	48.0	4.0

## White Crappie

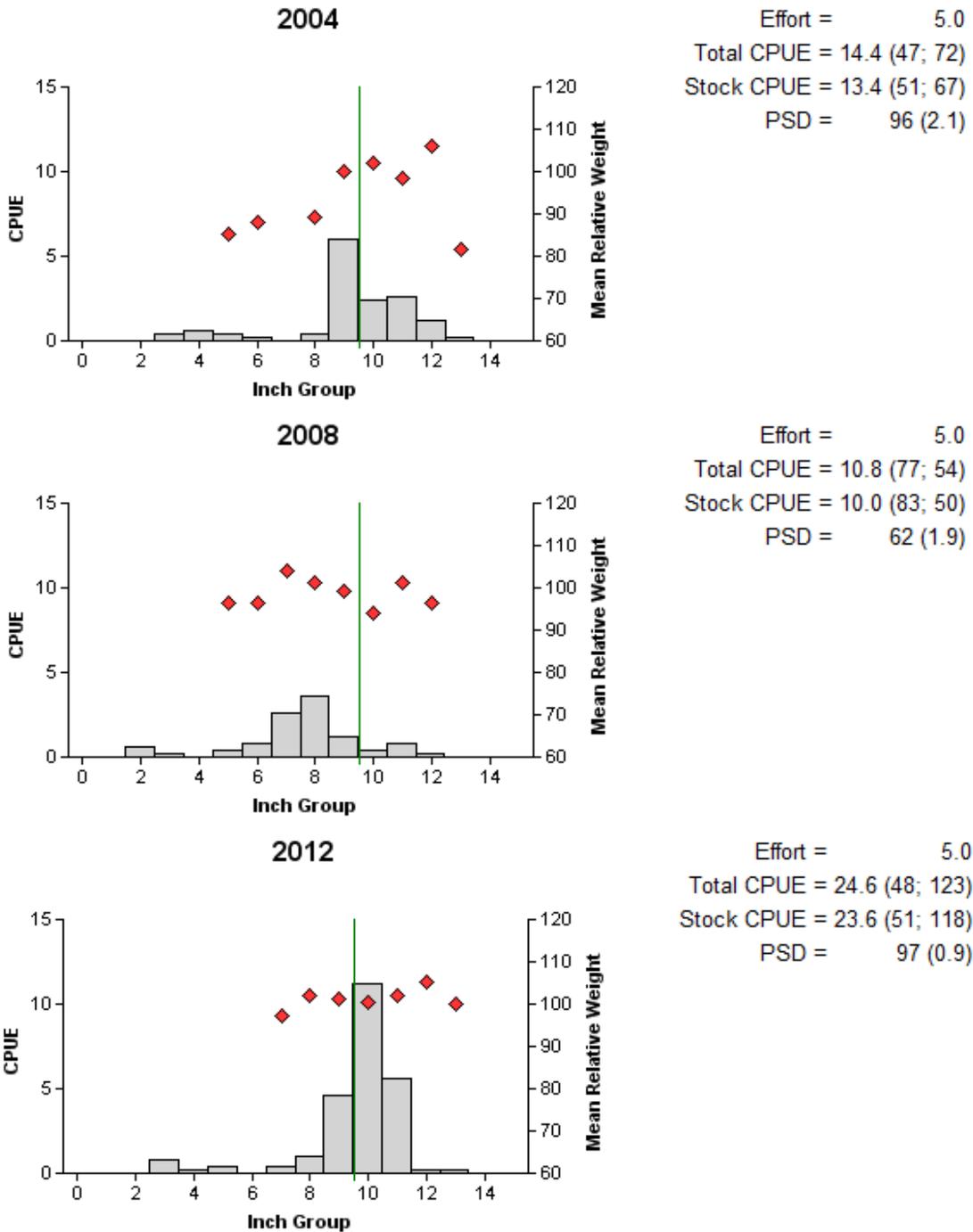


Figure 10. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Amon G. Carter Reservoir, Texas, 2004, 2008, and 2012. Vertical lines represent length limit at time of collection.

Table 14. Creel survey statistics for White Crappie at Amon G. Carter Reservoir from December 2007 - November 2008 and from September 2010 - August 2011, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of White Crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2007-2008	2010-2011
Directed effort (h) for crappie	8,741.17 (13)	15,922.81 (14)
Directed effort(h)/acre for crappie	4.73 (13)	8.61 (14)
Total catch per hour for crappie	4.10 (31)	4.46 (33)
Total harvest for White Crappie	12,368.00 (43)	31,466.37 (23)
Harvest/acre for White Crappie	6.69 (43)	17.03 (23)
Percent legal released for White Crappie	10.2	1.2

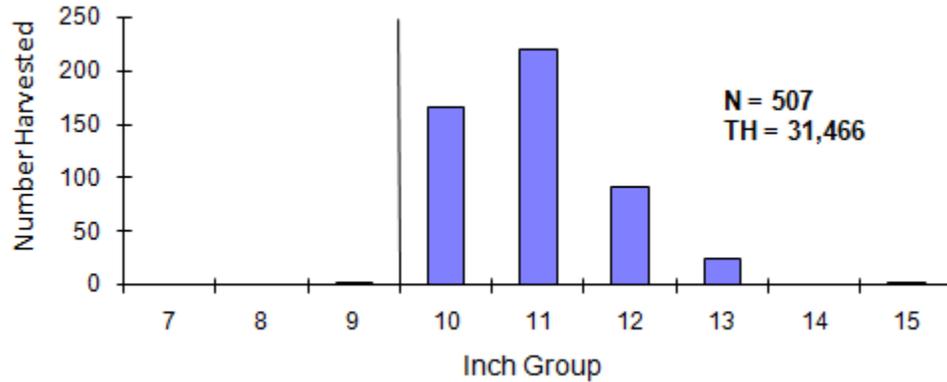


Figure 11. Length frequency of harvested White Crappie observed during creel surveys at Amon G. Carter Reservoir, Texas, September 2010 - August 2011, all anglers combined. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

## Black Crappie

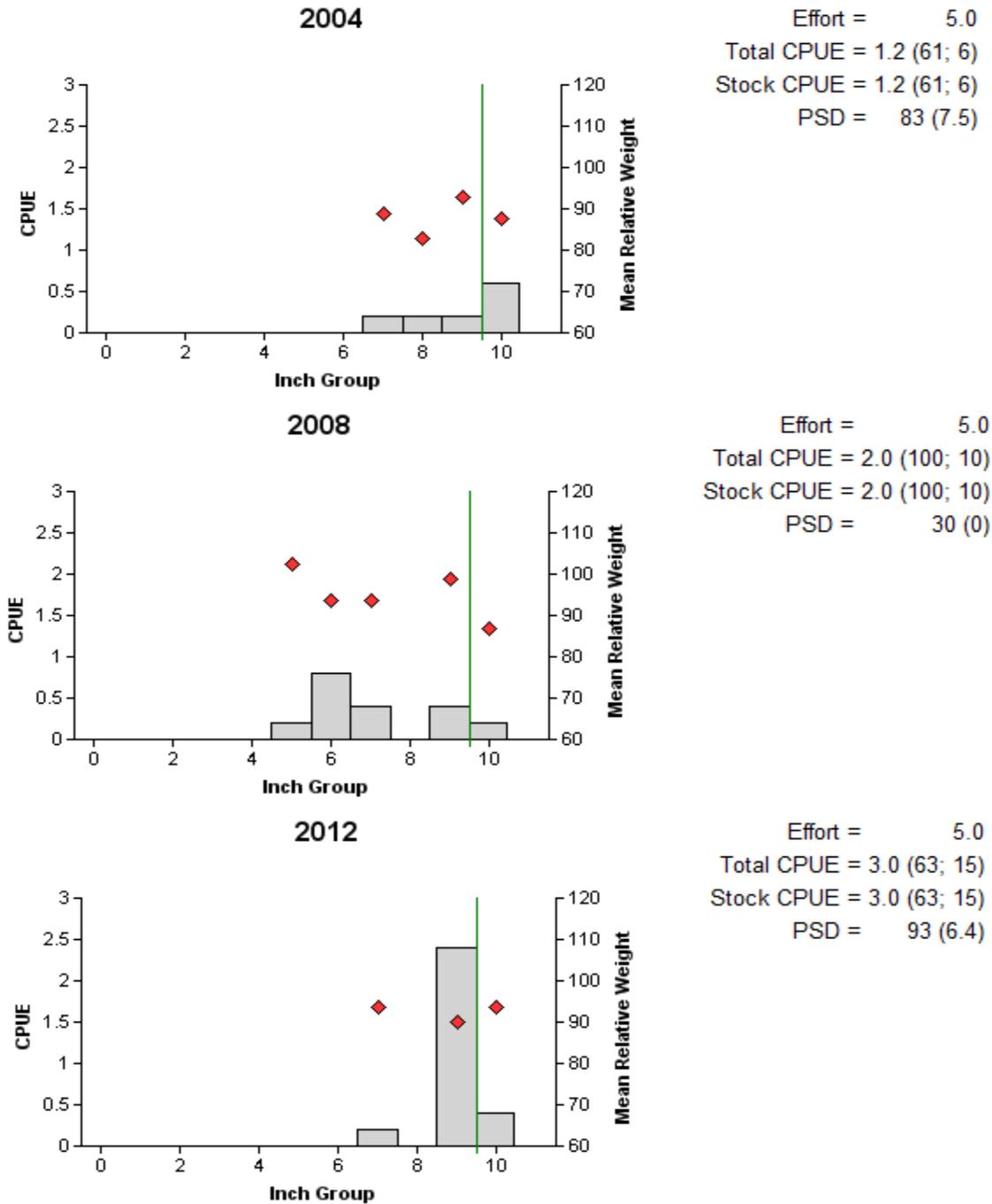


Figure 12. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Amon G. Carter Reservoir, Texas, 2004, 2008, and 2012. Vertical lines represent length limit at time of collection.

Table 15. Creel survey statistics for Black Crappie at Amon G. Carter Reservoir from December 2007 - November 2008 and from September 2010 - August 2011, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of Black Crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2007-2008	2010-2011
Directed effort (h) for crappie	8,741.17 (13)	15,922.81 (14)
Directed effort(h)/acre for crappie	4.73 (13)	8.61 (14)
Total catch per hour for crappie	4.10 (31)	4.46 (33)
Total harvest for Black Crappie	1,628.00 (68)	7,769.47 (39)
Harvest/acre for Black Crappie	0.88 (68)	4.20 (39)
Percent legal released for Black Crappie	0.0	5.3

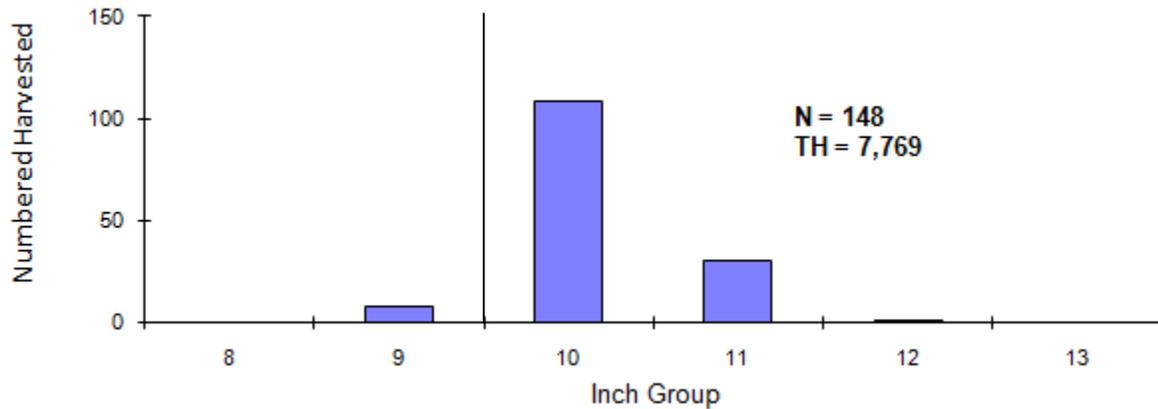


Figure 13. Length frequency of harvested Black Crappie observed during creel surveys at Amon G. Carter Reservoir, Texas, September 2010 - August 2011, all anglers combined. N is the number of harvested Black Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

Table 16. Proposed sampling schedule for Amon G. Carter Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

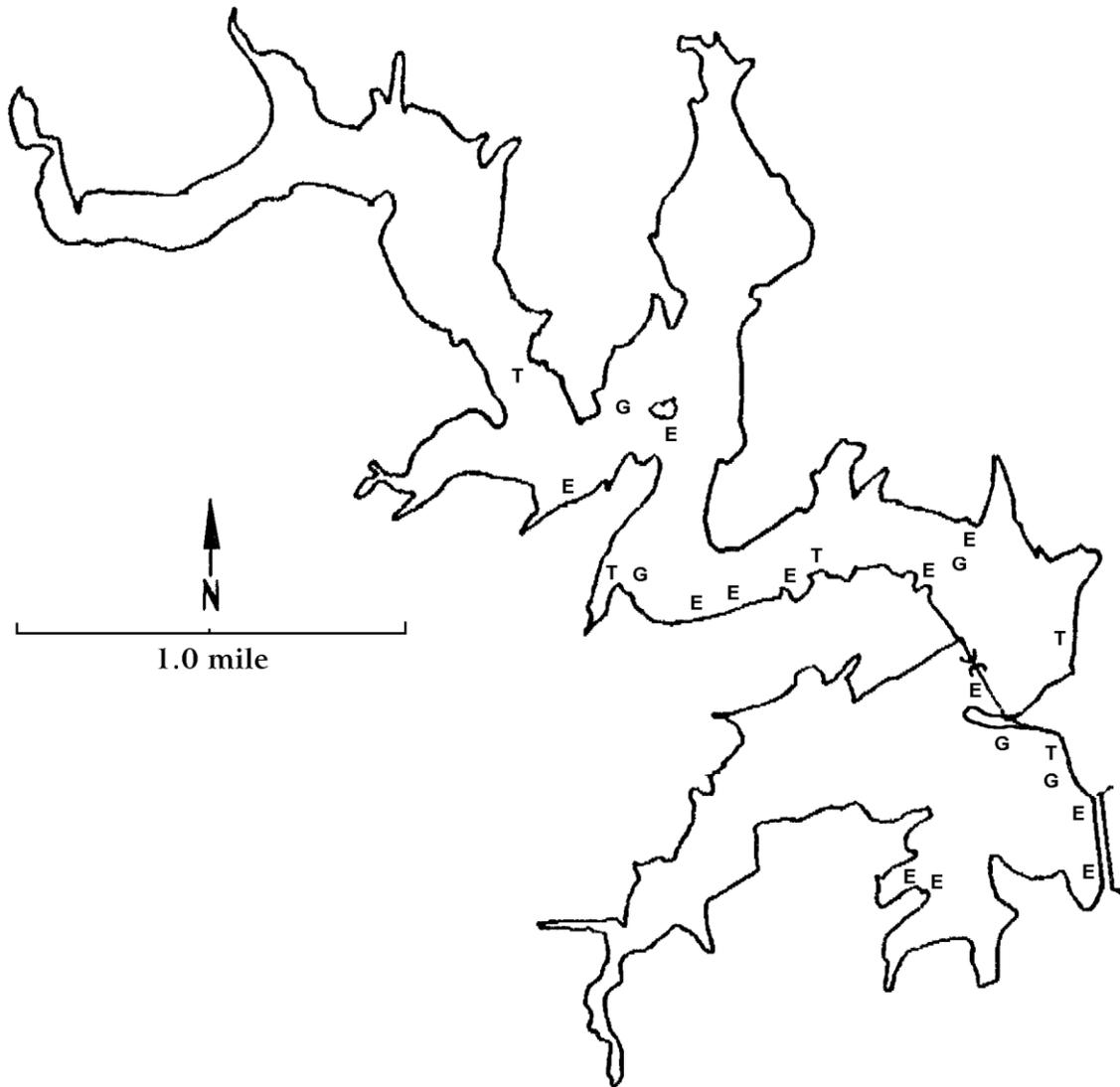
Survey year	Electrofishing Fall(Spring)	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2013-2014								
2014-2015	A							
2015-2016								
2016-2017	S	S	S		S	S		S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Amon G. Carter Reservoir, Texas, 2012-2013. Sampling effort was 5 net nights for gill netting and trap netting, and 1 hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					91	91.0
Threadfin Shad					2060	2060.0
Channel Catfish	17	3.4				
Flathead Catfish	1	0.2				
White Bass	112	22.4				
Green Sunfish					55	55.0
Warmouth					14	14.0
Bluegill					522	522.0
Longear Sunfish					155	155.0
Redear Sunfish					20	20.0
Largemouth Bass					113	113.0
White Crappie			123	24.6		
Black Crappie			15	3.0		

## APPENDIX B



Location of sampling sites, Amon G. Carter Reservoir, Texas, 2012-2013. Trap netting, gill netting, and electrofishing are indicated by T, G, and E, respectively. Water level was 4.75 feet below conservation level for electrofishing, 6.83 feet below conservation level for gill netting, and 6.11 feet below conservation level during trap netting.

## APPENDIX C

Catch rates (CPUE) of targeted species by gear type and year for Amon G. Carter Reservoir, Texas.

Gear	Species	Year								Avg
		2002 <sub>a</sub>	2004	2005	2008 <sub>b</sub>	2009	2010 <sub>a</sub>	2012	2013	
Gill Netting (fish/net night)	Channel Catfish			6.8		4.6			3.4	<b>4.9</b>
	Flathead Catfish			0.4		0.2			0.2	<b>0.3</b>
	White Bass			5.6		11.0			22.4	<b>13.0</b>
Electrofishing (fish/hour)	Gizzard Shad		709.0		65.0			91.0		<b>288.3</b>
	Threadfin Shad		219.0		575.0			2060.0		<b>951.3</b>
	Green Sunfish		102.0		34.0			55.0		<b>63.7</b>
	Warmouth		11.0		7.0			14.0		<b>10.7</b>
	Orangespotted Sunfish		0.0		1.0			0.0		<b>0.3</b>
	Bluegill		537.0		305.0			522.0		<b>454.7</b>
	Longear Sunfish		242.0		105.0			155.0		<b>167.3</b>
	Redear Sunfish		6.0		8.0			20.0		<b>11.3</b>
Largemouth Bass	54.0	149.0	136.0	105.0		73.0	113.0		<b>105.0</b>	
Trap Netting (fish/net night)	White Crappie		14.4		10.8			24.6		<b>16.6</b>
	Black Crappie		1.2		2.0			3.0		<b>2.1</b>

<sup>a</sup>Bass only electrofishing survey.

<sup>b</sup>Electrofishing survey was conducted using a 7.5 Smith-Root GPP (Gas Powered Pulsator). Electrofishing surveys prior to 2007 were conducted using a Smith-Root 5.0 GPP.