

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-35

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

Alvarado Park Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish Populations in Alvarado Park Reservoir were surveyed in 2009 with a boat electrofisher and in 2010 using gill nets. A spring quarter creel survey was completed during 2007. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Alvarado Park Reservoir is a 507-acre impoundment located near the city of Alvarado, Johnson County, Texas. We were unable to obtain the conservation pool elevation from the city of Alvarado as there is still no elevation monitoring system in place. However, the reservoir was at or near conservation pool during the sampling period. Primary water use is recreation. Alvarado Park Reservoir is eutrophic with stable productivity. Habitat features included natural shoreline, bulk heading, and boat docks/piers. Aquatic vegetation is limited to shoreline stands of cattail (*Typha* spp.) and bulrush (*Scirpus* spp.).
- **Management history:** Sport fishes in Alvarado Park Reservoir have always been managed with statewide regulations. Important sport fish include white bass, largemouth bass, and catfishes. Blue catfish were stocked in 2000 and 2001 as an additional predator to take advantage of an excellent prey base. An additional gill netting survey was conducted in 2004. Although the channel catfish population had rebounded by 2006, only one blue catfish was collected in that survey and so additional stockings were recommended. Blue catfish were stocked again in 2008 and 2009 at nearly 50/acre.

The 2002 survey report verified possible recruitment issues for legal-sized largemouth bass, and suggested angler harvest might be regulating the abundance of legal-sized fish. A 14-18" slot limit, five fish daily bag regulation was suggested in the 2002 survey report to protect adult fish to 18", as was a creel to survey attitudes and opinions of local anglers. It was decided at the time that a creel on Alvarado Park Reservoir would not be cost-effective. However, a creel was suggested again in the 2006 report, along with a supplemental electrofishing survey in fall 2007 to collect additional data on the largemouth bass fishery.

The 2006 survey report also outlined a supplemental trap netting survey in 2007 to monitor a weak crappie population, contacting the City of Alvarado to negotiate installment of a permanent gauging station, and conducting an updated physical habitat survey. The City of Alvarado was not able to install a gauging station at the time of contact.

- **Fish Community**
 - **Prey species:** The prey base is adequate to support current sport fish populations.
 - **Catfishes:** Catfish spp. was the most sought after sport fish in the spring 2007 creel. Blue catfish gill net catch rates continued to improve, while channel catfish gill net catch rates greatly exceeded long-term averages.
 - **White bass:** White bass populations continued to be excellent, and were the third most popular species among anglers in the creel.
- Largemouth bass:** The largemouth bass population continued to improve, and the 2009 sample was the best yet. It was the second most popular species among anglers, and the vast majority of anglers chose to release bass rather than harvest.
- **White crappie:** White crappie are present in the reservoir in low numbers, but trap netting was not conducted in 2009.
- **Management Strategies:** Conduct general monitoring with electrofishing, trap netting and gill netting in 2013-2014.

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INTRODUCTION

This document is a summary of fisheries data collected from Alvarado Park Reservoir in 2009-2010. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data is presented with the 2009-2010 data for comparison.

Reservoir Description

- Alvarado Park Reservoir is a 507-acre impoundment constructed in 1966. It is located in Johnson County near the City of Alvarado and is operated and controlled by the same. The primary water use is recreation although the City of Alvarado recently sold some water rights to a gas drilling company. Alvarado Park Reservoir is eutrophic with Secchi readings generally less than two feet. Habitat consists of natural shoreline, bulk heading, and boat docks/piers. Mean and maximum depths are six and 20 feet respectively. Water elevation data is currently not collected by the controlling authority. Boat access consists of a single public boat ramp, and bank fishing access is poor due to the majority of the reservoir's shoreline being privately owned. There is no public handicap access. Other descriptive characteristics for Alvarado Park Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Baird and Tibbs 2006) included:

1. Conduct a creel survey to assess the habits, attitudes, and opinions of largemouth bass anglers on Alvarado Park Reservoir in spring 2007.
Action: A quarter-creel survey was conducted during the summer quarter, 2007. Economic impact was minimal. Harvest of largemouth bass was very low, indicating that more restrictive regulations would have little impact on the bass population. Additional creel data can be found throughout this report.
2. Perform a supplemental electrofishing survey in fall 2007 to collect additional data on the largemouth bass fishery.
Action: A supplemental electrofishing survey was conducted in fall 2007 to collect additional data on the largemouth bass fishery. After reviewing the combined data from 2007 and 2009, the fishery appears to have improved. Those data can be found in this report.
3. Perform a supplemental trap netting survey in winter 2007 to collect additional data on the white crappie fishery.
Action: A supplemental trap netting survey was conducted in winter 2007 to collect additional data on the white crappie fishery. Catch rates of crappie remained low in that survey. Trap netting became an optional gear in 2009. Because of poor returns in previous surveys, it was not conducted in 2009.
4. Contact the City of Alvarado to begin negotiating installment of a permanent gauging station.
Action: The City of Alvarado was contacted about possible construction of a permanent gauging station. However, the cost of that project out-weighed benefits to the city at that time.
5. Stock blue catfish at 100/acre for two more consecutive years.
Action: Blue catfish were requested and stocked in 2008 and 2009; however the stocking rates were only 43/acre due to production limitations.
6. Continue routine gill netting surveys to monitor the blue catfish population.
Action: Routine gill netting was continued in 2010; those data are included in this report.

7. Perform a physical habitat survey prior to next report period using current technology.

Action: A physical habitat survey was completed in 2010; those data are included in this report.

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

Stocking history: Only a few stockings were conducted prior to 2000. Florida largemouth bass were stocked at 100/acre in both 1997 and 1998, channel catfish were stocked at nearly 50/acre in 1990, and coppernose bluegill were stocked at 50/acre in 1983. Blue catfish were stocked in 2000 (85,700), 2001 (50,600), 2008 (21,868), and 2009 (21,870). The complete stocking history is in Table 3.

Vegetation/habitat history: Alvarado Park Reservoir supported numerous species of aquatic vegetation in past surveys: Black willow, cattail, smartweed, bulrush, water-primrose, spike rush, water net, water willow and pondweed; however few of those species were observed in the 2010 physical habitat survey (Baird and Tibbs 2002). No nuisance species have ever been observed.

Water Transfer: Alvarado Park Reservoir was initially intended to be used as a municipal water supply for the City of Alvarado; however the reservoir has never been used as such and instead is used primarily for recreation. There are currently no permanent pumping stations on the reservoir other than domestic irrigation systems, and none are planned for the near future. In 2010 the City of Alvarado sold short-term water rights to a gas company for 70,000 barrels to be collected during May and June, and this one-time operation was completed in May. Similar operations will no doubt present themselves to the City of Alvarado in the future.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations) and gill 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 nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys, including the creel were conducted according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 2008).

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 for creel statistics and SE was calculated for structural indices and IOV. Fish aging became optional in 2004, and no new age and growth data were collected from the 2009/2010 survey. The most recent age and growth information for Alvarado Park Reservoir can be found in Baird and Tibbs (2002).

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consists primarily of natural shoreline, bulk heading, and boat docks/piers. A littoral zone habitat survey was conducted this year (Table 4).

Creel: A creel survey was conducted during the spring quarter, 2007 to determine angler effort as well as catch rates of popular sport fish species. Trip expenditures totaled \$20,478. Effort and harvest per acre were on the upper end of rates observed in other reservoirs in the district.

Prey species: The catch rates of all prey species were below historical averages but still plentiful. Prey species and catch rates included: bluegill (228/hr), longear sunfish (36/hr), gizzard shad (67/hr), and threadfin shad (225/hr) (Figures 1, 2, and 3; Appendices A and B). The gizzard shad index of vulnerability (IOV) was low with less than 39% of the gizzard shad population available as prey for predators (DiGenzo et al. 1996). For all other species, the majority of the sizes available were suitable as prey. This reduction in prey availability is likely in response to improving numbers and/or size distributions in sportfish species and is not currently a cause for concern.

Catfishes: Blue catfish were stocked for the first time in 2000, with additional stockings in 2001, 2008, and 2009. The catch rate in 2010 reached 1.0 for the first time, and all collected fish were of legal size (Figure 4). Channel catfish were stocked once in 1990. The channel catfish sample collected in 2010 was the best from recent records, with a catch rate of 17.8/nn, compared to a historical catch rate of 7.2/nn (Figure 5). Individuals up to 22 inches were collected. Similar to the previous two samples, relative weights (Wr) were higher for larger fish. Catfish spp. were the most sought after fish group in the spring, 2007 creel survey, with 33.6% of anglers fishing for catfish totaling 7.34 hours/acre (Table 5 and 6). They were also the most successful angler group, with a catch rate of 2.0/h and a total harvest for the 2007 spring quarter of 4.05 catfish spp./acre.

White bass: A high density white bass population exists in Alvarado Park Reservoir. Additionally, the size structure of the population is impressive, with a catch rate in 2010 of 25.6/n and large numbers of fish from 12" to more than 16" each of the last three surveys (Figure 8). White bass were the third most sought after sport fish, with 20.5% of anglers targeting them, totaling 4.49 hours/acre (Table 5 and 7). Total harvest for the 2007 spring quarter was 6.17 white bass/acre. However, it appeared that anglers were not successful at locating larger fish, as all fish in the creel were less than 14" in length (Figure 8).

Largemouth bass: The largemouth bass catch rate (166/hr) was similar to the historical average (200/hr). For the first time in the last three surveys, bass in excess of 20" were collected (Figure 9) while at the same time, PSD improved to 39. Genetic analysis in 2005 revealed that almost half of the genetic composition of the largemouth bass population was Florida in origin. Largemouth bass was the second most commonly sought after fish in the spring, 2007 creel survey, with 22.1% of anglers targeting this species, for a total of 4.83 hours/acre (Table 5 and 9). Only a single bass was harvested during the spring quarter.

White crappie: Trap netting became an optional gear in 2009, and since the three most recent crappie surveys have failed to collect useful sample sizes, trap netting was not conducted during this survey period. White crappie are still present in the reservoir. Anglers targeted them at a rate of 2.47 hours/acre, caught them at a rate of 0.82 fish/h and harvested them at a rate of 1.27/acre (Table 5 and 10). Interestingly, 11.3% of all anglers were seeking crappie, indicating the importance of this species. Accordingly, trap netting will be resumed during 2013.

Fisheries management plan for Alvarado Park Reservoir, Texas

Prepared – July 2010.

ISSUE 1: Angler effort and harvest for many species in the spring, 2007 creel survey exceeded rates observed in other district lakes.

MANAGEMENT STRATEGY

1. Monitor fish populations during standard surveys, including trap netting in 2013/2014.

ISSUE 2: The City of Alvarado entered into an annual contract to provide water to a gas drilling company. This is likely to occur more often in the future.

MANAGEMENT STRATEGY

1. Contact city officials and suggest that some of the proceeds from future contracts be used as funds to match Federal grant money for a boat ramp project.

ISSUE 3: 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 Alvarado to post appropriate signage at all access points around the reservoir.
2. Make a speaking point about exotic species when presenting to constituent and user groups.
3. Keep track of (i.e., map) all existing and future inter-basin water transfer routes to facilitate potential exotic species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes general monitoring with electrofishing and gill netting in 2013 and 2014 (Table 11).

LITERATURE CITED

- 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.
- Baird, M. S. and J. Tibbs. 2002. Statewide freshwater fisheries monitoring and management program survey report for Alvarado Park Reservoir, 2002. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- Baird, M. S. and J. Tibbs. 2006. Statewide freshwater fisheries monitoring and management program survey report for Alvarado Park Reservoir, 2006. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimert. 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. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional Size Distribution (PSD): A Further Refinement of Population Size Structure Index Terminology. Fisheries volume 32, number 7: 348
- Texas Parks and Wildlife Department, Inland Fisheries Division, 2002. Fishery Assessment Procedures, unpublished manual revised 2003.

Table 1. Characteristics of Alvarado Park Reservoir, Texas.

Characteristic	Description
Year Constructed	1966
Controlling authority	City of Alvarado
Counties	Johnson
Reservoir type	Tributary
Shoreline Development Index (SDI)	1.5
Conductivity	363 umhos/cm

Table 2. Harvest regulations for Alvarado Park Reservoir, Texas.

Species	Bag Limit	Length limit (inches)
Catfish: channel and blue	25 (any combination)	12" minimum
Catfish, flathead	5	18" minimum
Bass, white	25	10" minimum
Bass: largemouth	5	14" minimum
Crappie: white and black	25 (any combination)	10" minimum

Table 3. Stocking history of Alvarado Park 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.

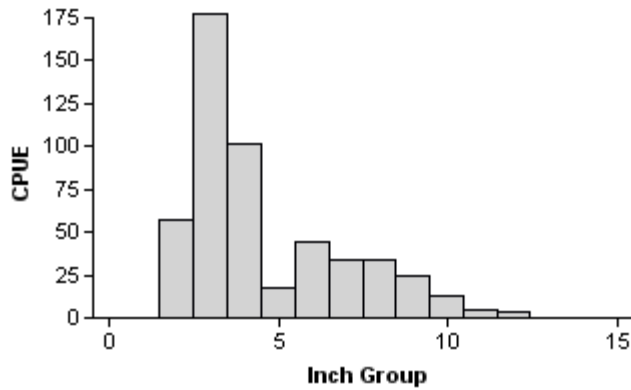
Species	Year	Number	Life Stage	Mean TL (in)
Blue catfish	2000	85,700	FGL	2.2
	2001	50,600	FGL	2.4
	2008	21,868	FGL	2.0
	2009	21,870	FGL	2.0
	Total	180,038		
Channel catfish	1990	26,039	FGL	2.5
	Total	26,039		
Coppernose bluegill	1983	27,000	UNK	UNK
	Total	27,000		
Florida Largemouth bass	1997	50,857	FGL	1.3
	1998	51,495	FGL	1.5
	Total	102,352		

Table 4. Survey of littoral zone and physical habitat types, Alvarado Park Reservoir, Texas, 2010. Linear shoreline distance (miles) and percent of linear shoreline distance was recorded for each habitat type. Native emergent shoreline vegetation was also given an acreage estimate. Percent of total shoreline distance is blank for boat docks/piers because they were dually coded with adjacent habitat.

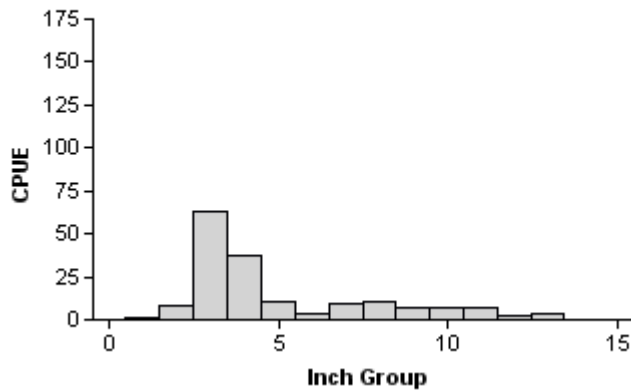
Shoreline habitat type	Shoreline Distance		Acres	Surface Area	
	Miles	Percent of total		Percent of surface area	
Bulk heading	1.00	11.61			
Gravel shoreline (rocks < 4")	0.03	0.36			
Rocky shoreline (rocks > 4")	0.42	4.90			
Natural shoreline	7.12	83.03			
Boat docks/piers	0.27				
Native emergents			19.92	3.93	

Table 5. Percent directed angler effort, directed catch per hour, total catch, and total released for all anglers by species for Alvarado Park Reservoir, Texas, March 1 – May 31, 2007.

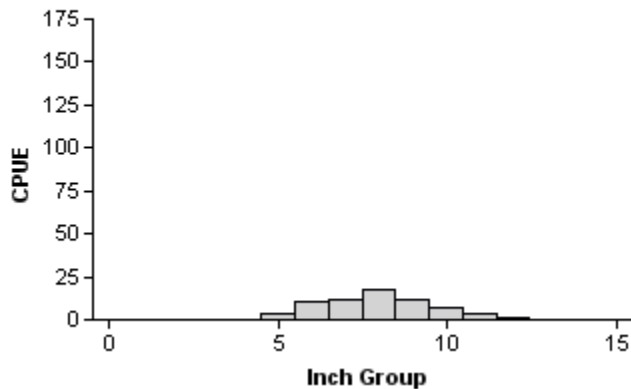
Species	Percent directed effort	Directed catch per hour	Total harvested	Total released
Blue catfish			80	0
Channel catfish			1363	1497
Catfish spp.	33.6	2.0	609	1708
White bass	20.5	0.4	3128	1287
Bluegill				406
Largemouth bass	22.1	0.9	80	2280
White crappie			401	440
Crappie spp.	11.3	0.8	241	135
Freshwater drum				34
Anything	12.4	1.3		

Gizzard shad**2001**

Effort = 1.0
 Total CPUE = 510.0 (18; 510)
 Stock CPUE = 114.0 (14; 114)
 IOV = 84.31 (4.2)

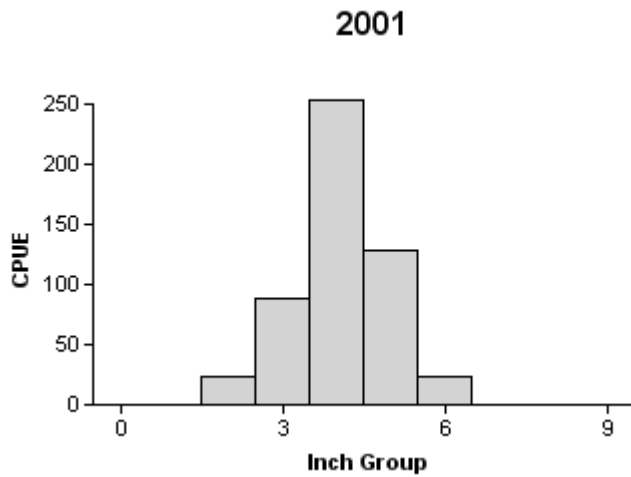
2005

Effort = 1.0
 Total CPUE = 168.0 (17; 168)
 Stock CPUE = 45.0 (35; 45)
 IOV = 78.57 (6.2)

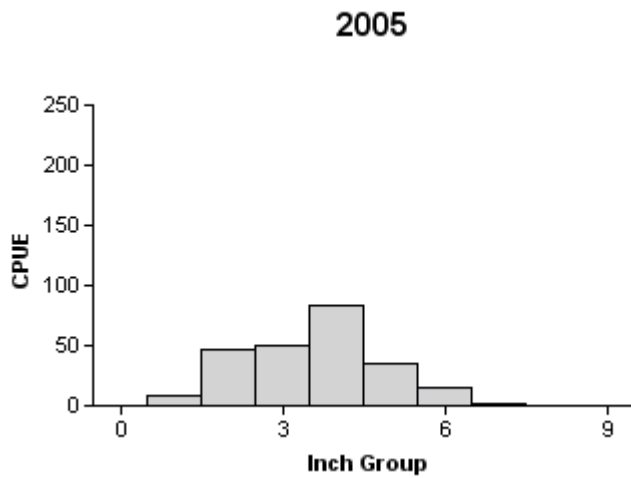
2009

Effort = 1.0
 Total CPUE = 67.0 (22; 67)
 Stock CPUE = 53.0 (22; 53)
 IOV = 38.81 (8.5)

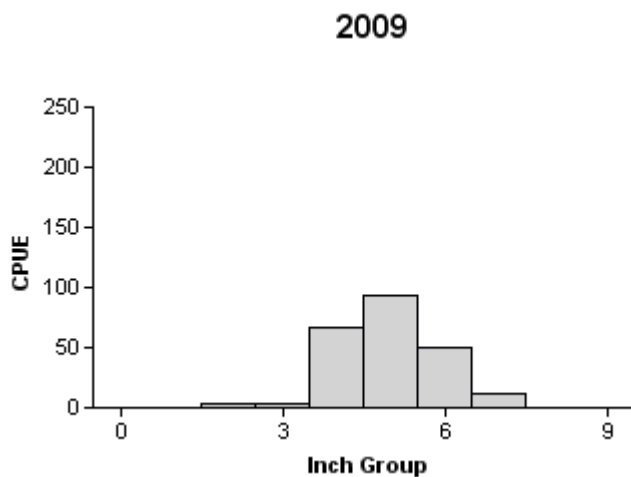
Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Alvarado Park Reservoir, Texas, 2001, 2005, and 2009.

Bluegill

Effort = 1.0
 Total CPUE = 518.0 (21; 518)
 Stock CPUE = 494.0 (21; 494)
 PSD = 5 (0.9)



Effort = 1.0
 Total CPUE = 241.0 (33; 241)
 Stock CPUE = 185.0 (44; 185)
 PSD = 9 (2.2)



Effort = 1.0
 Total CPUE = 228.0 (19; 228)
 Stock CPUE = 225.0 (18; 225)
 PSD = 27 (4.2)

Figure 2. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Alvarado Park Reservoir, Texas, 2001, 2005, and 2009.

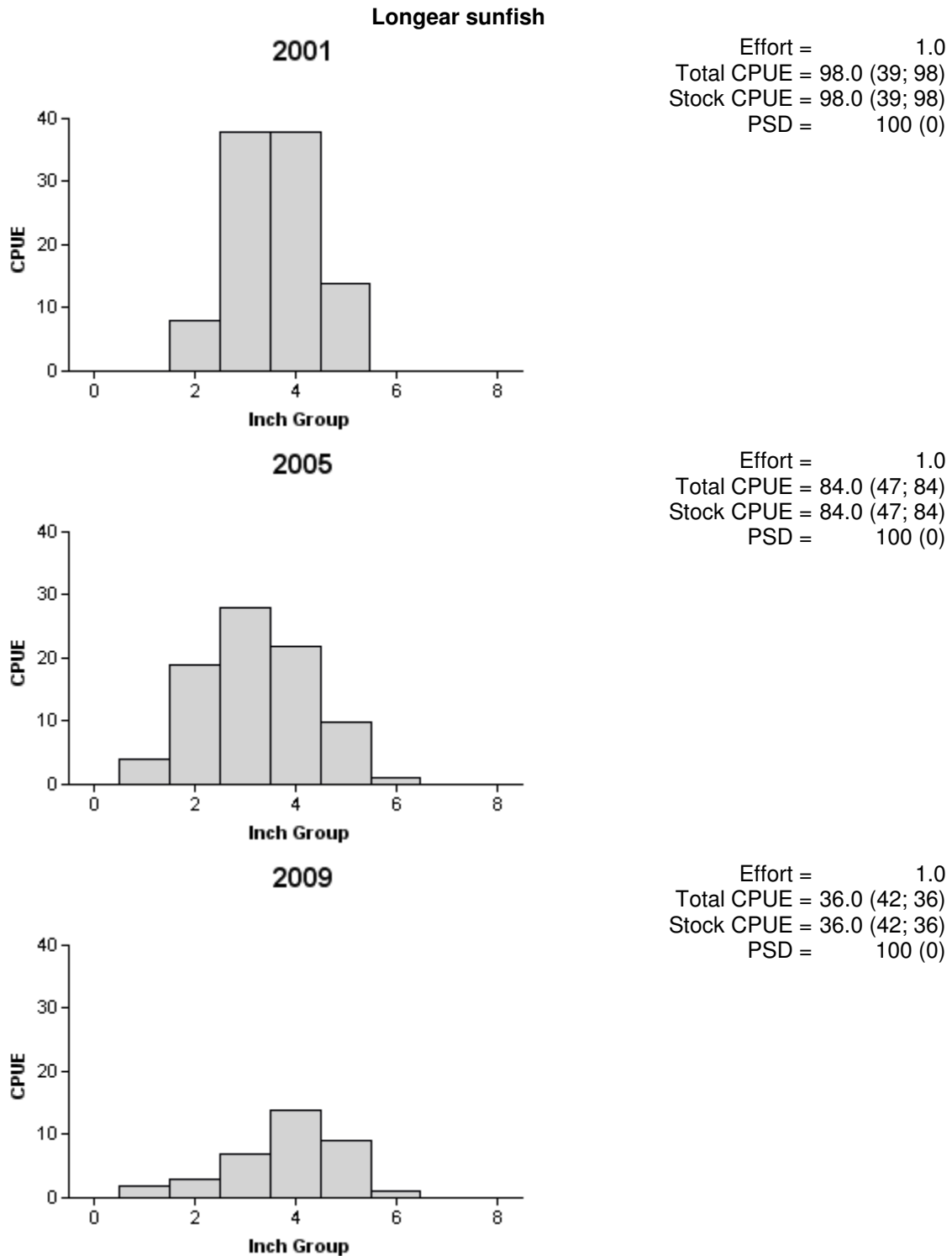


Figure 3. Number of longear sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Alvarado Park Reservoir, Texas, 2001, 2005, and 2009.

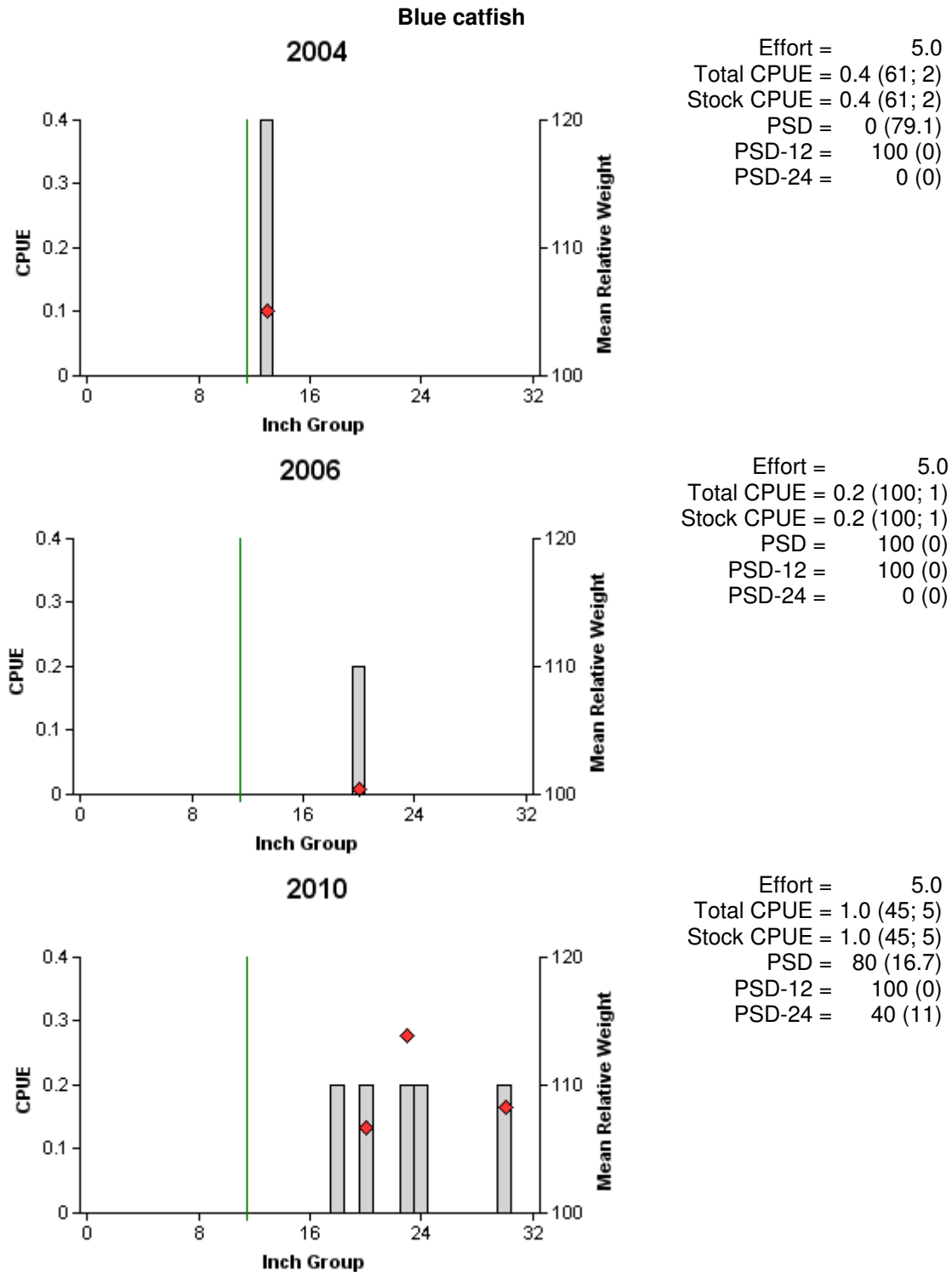


Figure 4. Number of blue catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Alvarado Park Reservoir, Texas, 2004, 2006, and 2010.

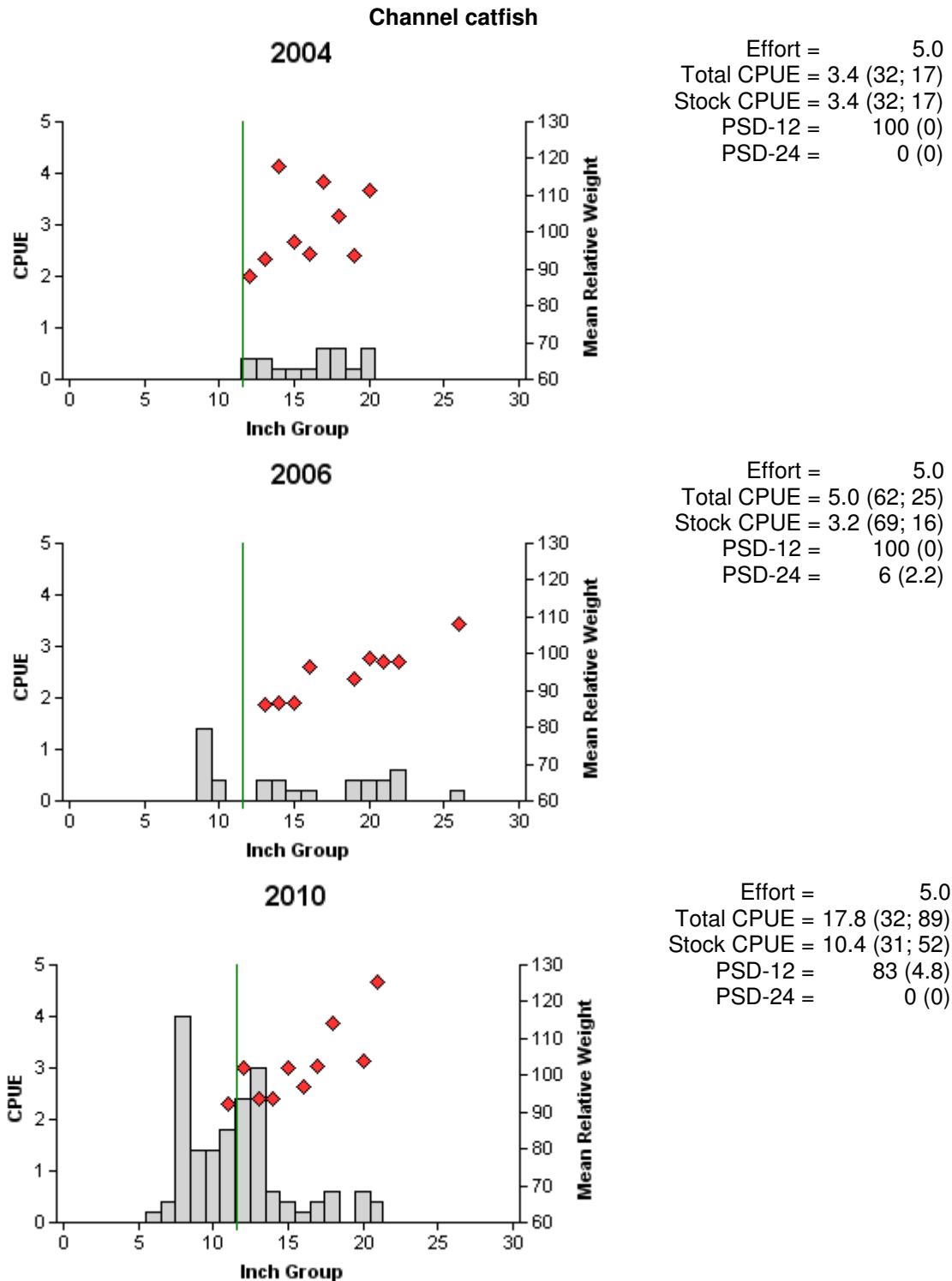


Figure 5. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Alvarado Park Reservoir, Texas, 2004, 2006, and 2010.

Table 6. Creel survey statistics for catfish spp. at Alvarado Park Reservoir, March through May 2007. Total harvest, total released, and harvest/acre are cumulative totals for all species of catfish in the reservoir. Relative standard errors (RSE) are in parentheses.

Directed effort (h)	3723.16 (32)
Directed effort/acre	7.34
Total catch per hour	1.96 (78)
Total harvest	2052
Total released	3205
Harvest/acre	4.05

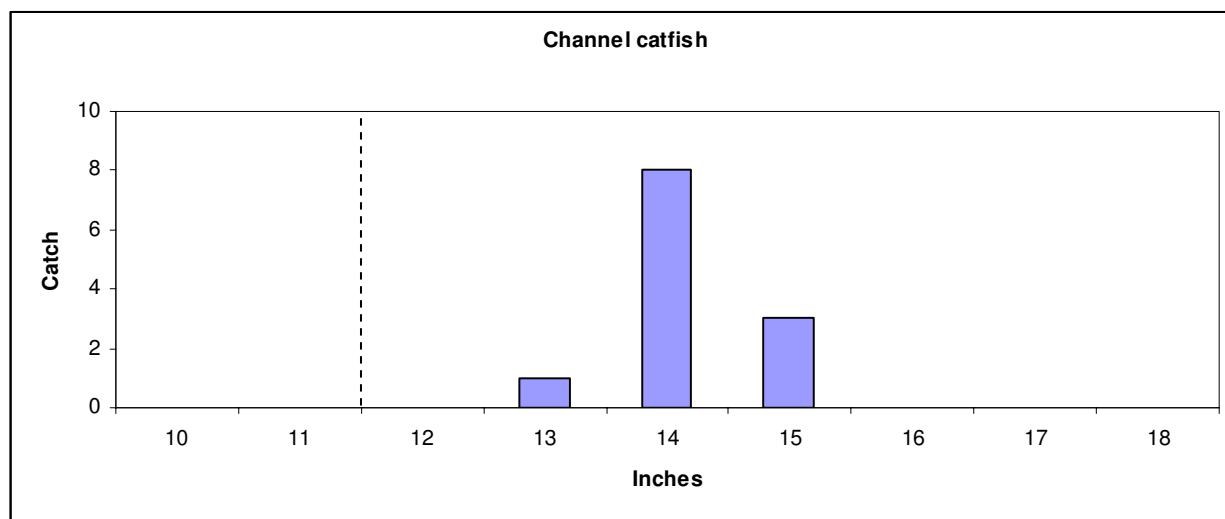


Figure 6. Length frequency of harvested channel catfish observed during creel surveys at Alvarado Park Reservoir, March through May 2007, all anglers combined.

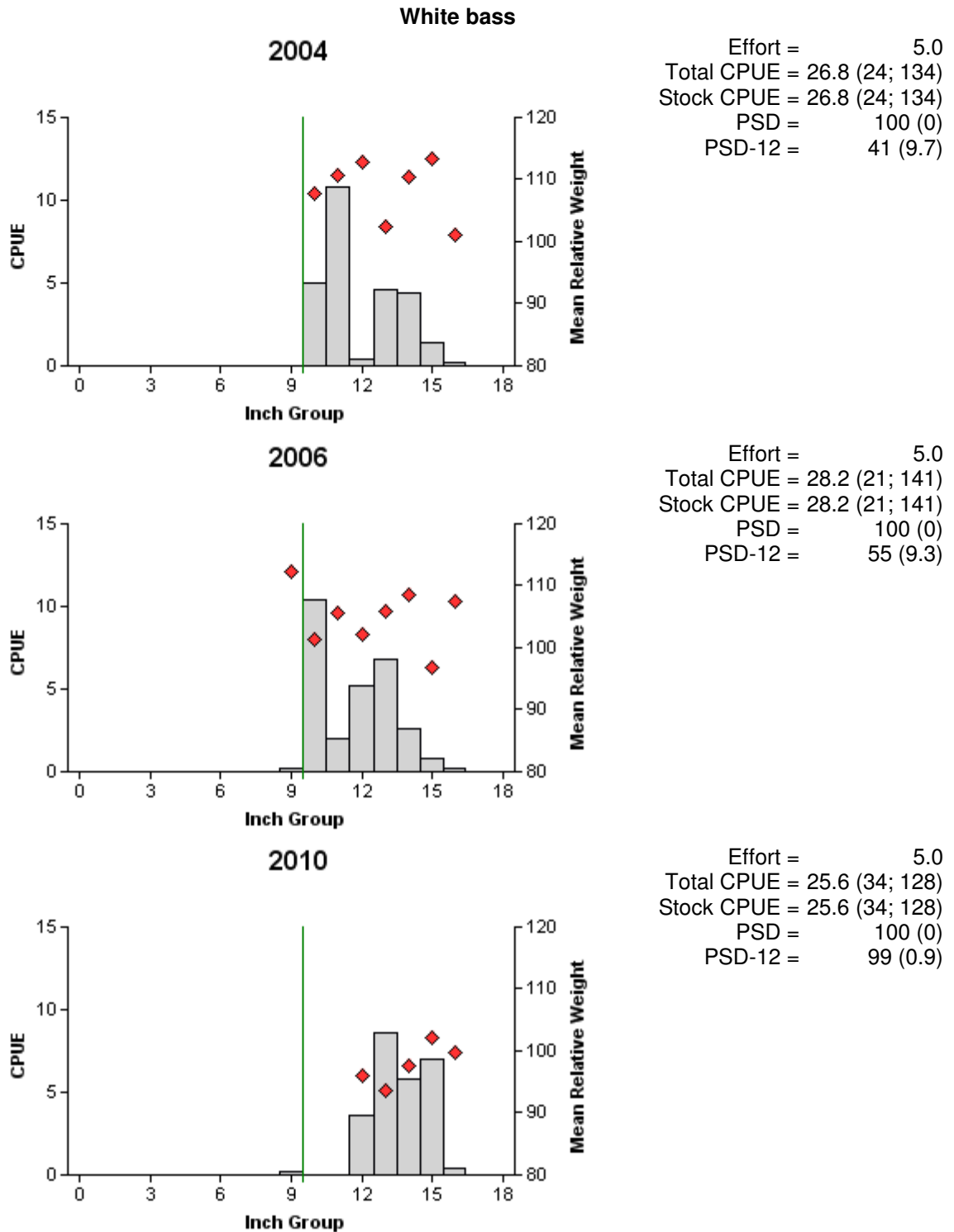


Figure 7. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Alvarado Park Reservoir, Texas, 2004, 2006, and 2010.

Table 7. Creel survey statistics for white bass at Alvarado Park Reservoir, March through May 2007. Relative standard errors (RSE) are in parentheses.

Directed effort (h)	2276.40 (40)
Directed effort/acre	4.49
Total catch per hour	0.45 (66)
Total harvest	3128
Total released	1287
Harvest/acre	6.17

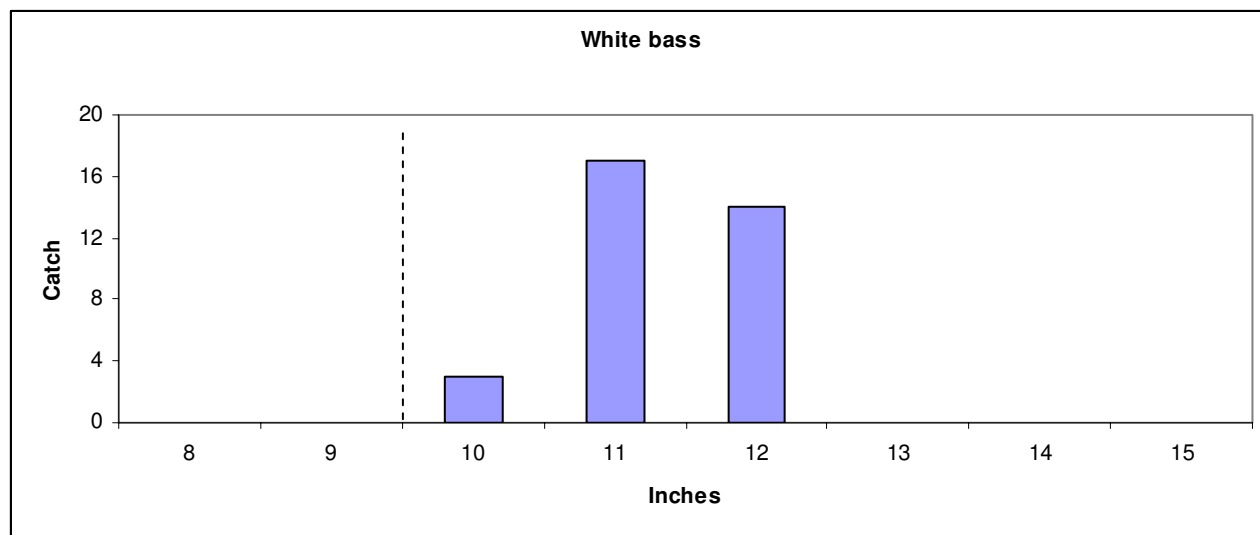


Figure 8. Length frequency of harvested white bass observed during creel surveys at Alvarado Park Reservoir, March through May 2007, all anglers combined.

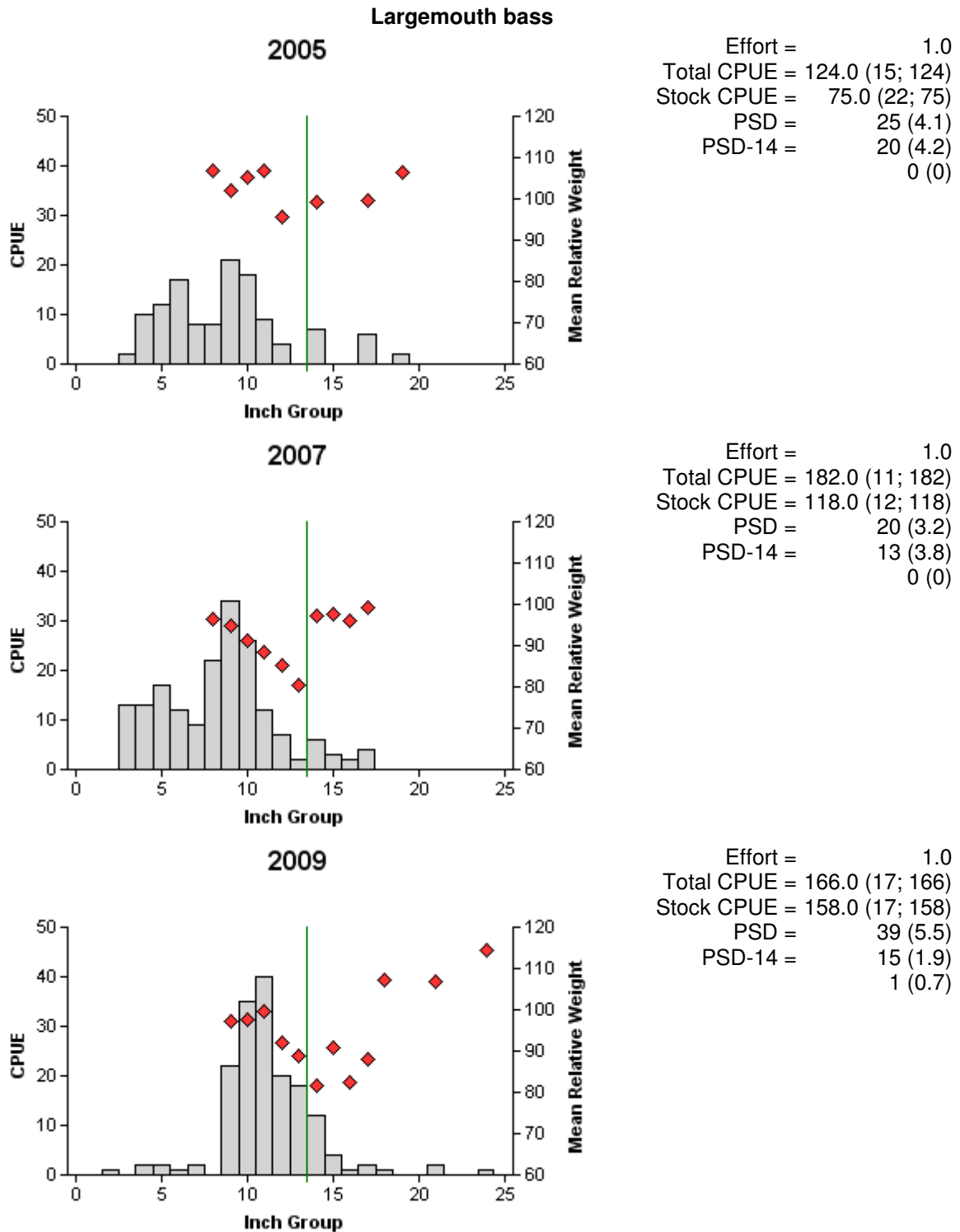


Figure 9. Number of largemouth bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Alvarado Park Reservoir, Texas, 2005, 2007, and 2009.

Table 8. Results of genetic analysis of largemouth bass collected by fall electrofishing, Alvarado Park Reservoir, Texas, 1998, 2001, and 2005. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
1998	30	4	8	13	5	41.7	13.3
2001	30	3	8	14	5	35.8	10
2005	30	2	1	25	2	49.5	7

Table 9. Creel survey statistics for largemouth bass at Alvarado Park Reservoir, March through May 2007. Relative standard errors (RSE) are in parentheses.

Directed effort (h)	2449.23 (39)
Directed effort/acre	4.83
Total catch per hour	0.90 (47)
Total harvest	80
Total released	2280
Harvest/acre	0.16

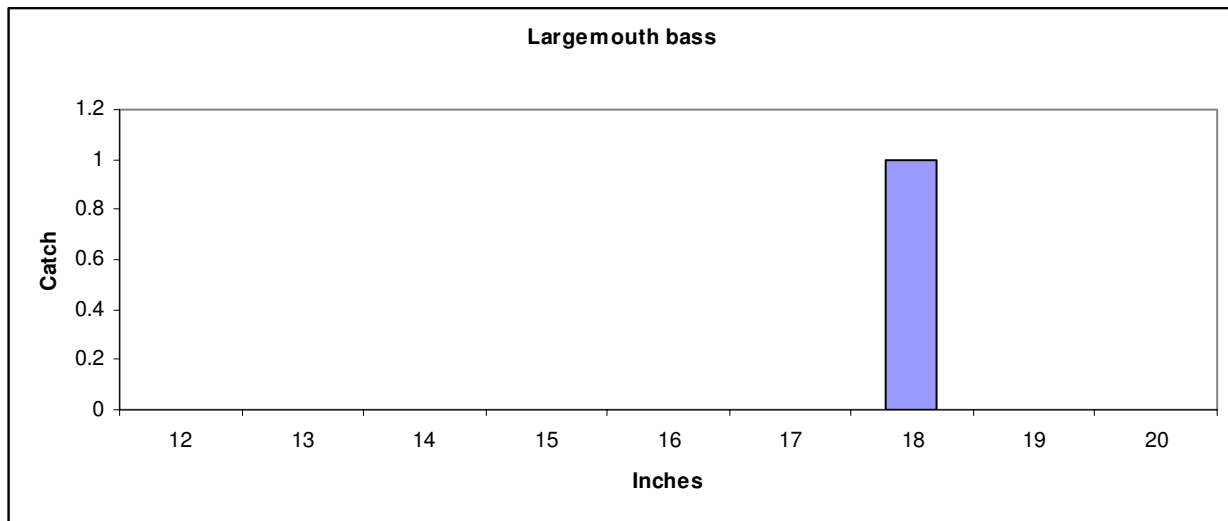


Figure 10. Length frequency of harvested largemouth bass observed during creel surveys at Alvarado Park Reservoir, March through May 2007, all anglers combined.

Table 10. Creel survey statistics for white crappie at Alvarado Park Reservoir, March through May 2007. Relative standard errors (RSE) are in parentheses.

Directed effort (h)	1253.18 (52)
Directed effort/acre	2.47
Total catch per hour	0.82 (62)
Total harvest	643
Total released	576
Harvest/acre	1.27

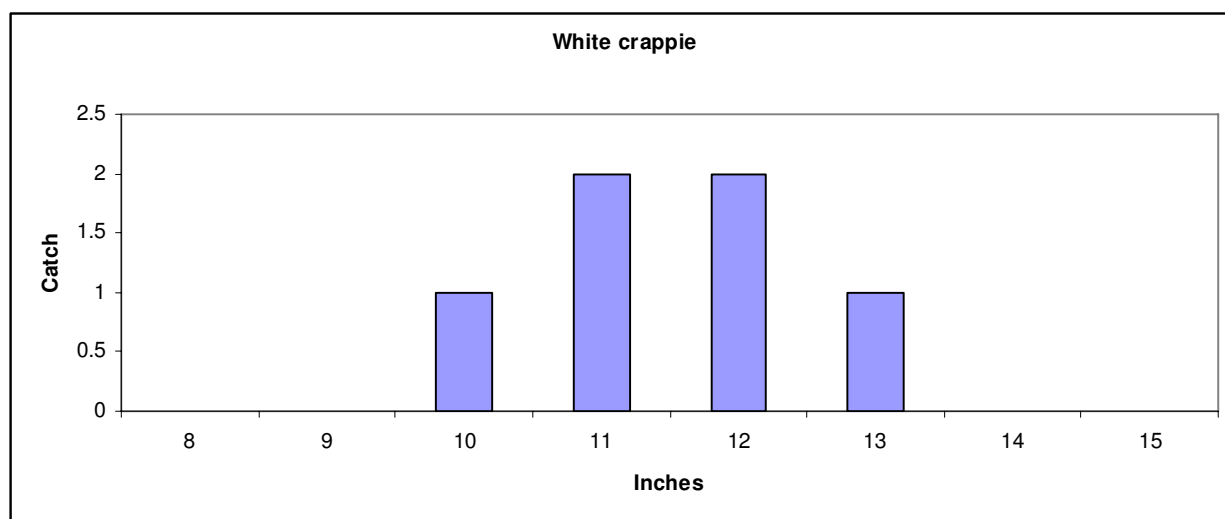


Figure 11. Length frequency of harvested white crappie observed during creel surveys at Alvarado Park Reservoir, March through May 2007, all anglers combined.

Table 11. Proposed sampling schedule for Alvarado Park Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall. Winter trap netting became optional in 2009. Standard survey denoted by S and additional survey denoted by A.

Survey Year	Electrofisher	Trap Net	Gill Net	Habitat Survey	Report
Fall 2010-Spring 2011					
Fall 2011-Spring 2012					
Fall 2012-Spring 2013					
Fall 2013-Spring 2014	S	S	S		S

APPENDIX A

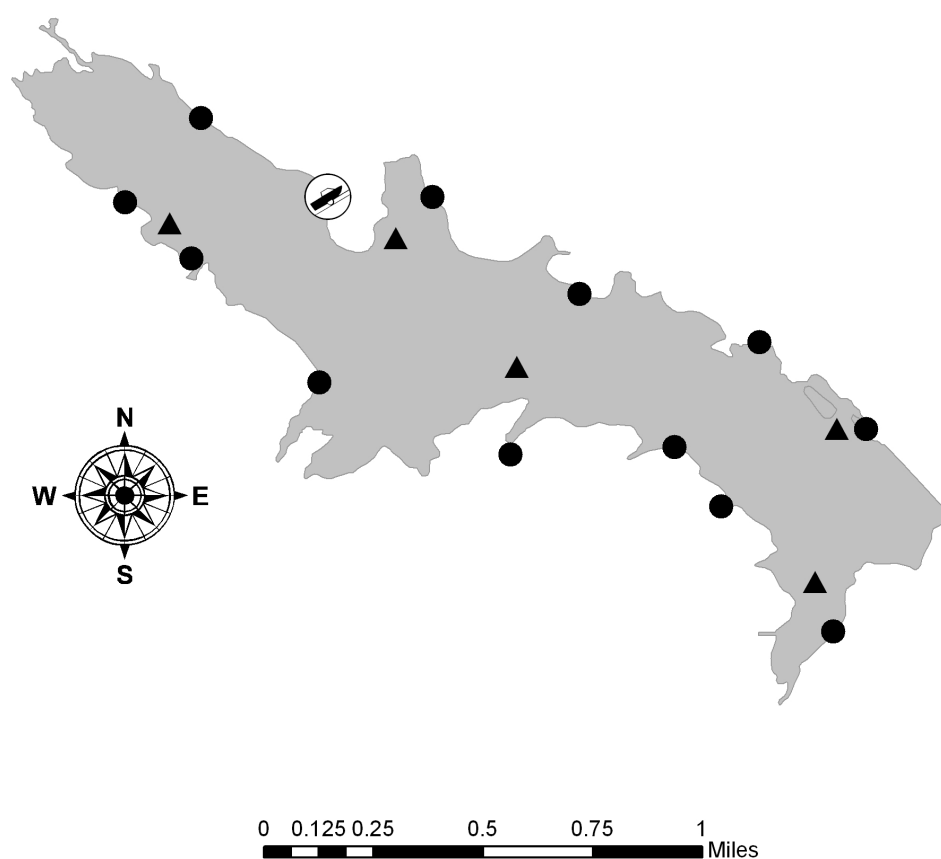
Number (N) and catch rate (CPUE) of all target species collected from electrofishing and gill netting surveys on Alvarado Park Reservoir, Texas, 2009-2010.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard shad			67	67.00
Threadfin shad			225	225.00
Channel catfish	89	17.80		
Blue catfish	5	1.00		
Flathead catfish	2	0.40		
White bass	128	25.60		
Warmouth			1	1.00
Bluegill			228	228.00
Longear sunfish			36	36.00
Redear sunfish			16	16.00
Largemouth bass			166	166.00

APPENDIX B

Catch rates (CPUE) of targeted species by gear type for Alvarado Park Reservoir, Texas, 1998 to present. All stations were randomly selected and all electrofishing stations were shocked with a 5.0 Smith-Root GPP (Gas Powered Pulsator). Species averages are in bold.

Gear	Species	1998	2001	2002	2004	2005	2006	2007	2009	2010	Avg.
<u>Electrofisher</u>											
	Largemouth Bass	223	305			124		182	166		200
	Gizzard Shad	134	510			168			67		220
	Threadfin Shad	3468	582			2801			225		1769
	Bluegill sunfish	369	518			241			228		339
	Redear sunfish	8	20			14			16		15
	Longear sunfish	74	98			84			36		73
	Green sunfish	16	6			8					10
	Warmouth	1	3			7			1		3
<u>Gillnets</u>											
	Blue catfish				0.4		0.6			1.0	0.7
	Channel catfish	5.6		4.0	3.4		5.0			17.8	7.2
	White bass	22.6		29.4	26.8		28.2			25.6	26.5
	Flathead catfish						0.4			0.4	0.4
<u>Trap nets</u>											
	White crappie	51.6	0.6			2.6		1.2			14.0

APPENDIX C

Location of sampling sites, Alvarado Park Reservoir, Texas, 2009-2010. Gill net and electrofishing stations are indicated by triangles and circles respectively. Water level was at full pool at time of sampling.