

Alvarado Park Reservoir

2017 Fisheries Management Survey Report

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

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Survey and Management Summary

Fish populations in Alvarado Park Reservoir were surveyed in 2017 using electrofishing and in 2018 using gill netting. Historical data are presented with the 2017-2018 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: Alvarado Park Reservoir is a 507-acre impoundment located near the City of Alvarado, Johnson County, Texas and is operated by the City of Alvarado. Primary water use is recreation and flood control. Bank and boat access has been fair in the past, yet lacked handicap facilities. The current boat ramp is being renovated and new facilities are being constructed at the time of this report writing. Habitat features consisted mainly of natural shoreline, bulk heading, boat docks and piers, and emergent aquatic vegetation.

Management History: Important sport fish include Largemouth Bass, White Bass and Channel Catfish. Since 2013, management efforts have focused on posting appropriate aquatic invasive species (AIS) signage at access points to try and prevent the spread of zebra mussels into the reservoir, and supporting the statewide public relations campaign "Clean. Drain. Dry". The City of Alvarado successfully applied for a federal Boating Access Grant administered through Texas Parks and Wildlife Department (TPWD), and renovation and construction was in progress as of March 2018. Recent management efforts include full aquatic vegetation and boater access surveys conducted during summer 2017.

Fish Community

- **Prey species:** Gizzard Shad and Threadfin Shad were present in the reservoir in reduced numbers from the previous survey. Electrofishing catch of Bluegill was high, but few other sunfishes were collected.
- **Catfishes:** Channel Catfish were abundant. Most individuals were in excellent condition and there were lots of legal-length fish for anglers. Blue and Flathead Catfish were also present in the reservoir.
- **White Bass:** Only one White Bass was collected despite doubling gill netting effort.
- **Largemouth Bass:** Largemouth Bass were abundant and in good condition. There were far more legal-length fish available to anglers than in the previous survey.
- **White Crappie:** White Crappie, although not targeted, were moderately abundant.

Management Strategies: The sport fishes in Alvarado Park Reservoir will continue to be managed with statewide regulations. We will continue to maintain AIS signage at access points and inform the public about the negative impacts of AIS. Access and vegetation surveys will be conducted in summer 2021, and electrofishing and gill net surveys will be conducted in 2021 and 2022 respectively.

Introduction

This document is a summary of fisheries data collected from Alvarado Park Reservoir in 2017-2018. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2017-2018 data for comparison.

Reservoir Description

Alvarado Park Reservoir is a 507-acre impoundment located near the city of Alvarado, Johnson County, Texas and is operated by the City of Alvarado. The primary water use was recreation and flood control although the City of Alvarado has sold water rights to gas drilling companies in recent years. Alvarado Park Reservoir is eutrophic with Secchi readings generally less than two feet. Habitat consisted of natural shoreline, bulk heading, and boat docks and piers. Mean and maximum depths were six and 20 feet respectively. Habitat features included natural shoreline, bulk heading, and boat docks/piers. Aquatic vegetation is limited to shoreline stands of bulrush (*scirpus spp.*), American water-willow (*Justicia americana*), cattail (*typha spp.*) and common buttonbush (*Cephalanthus occidentalis*). There are currently no sources for water level data for Alvarado Park Reservoir. Other descriptive characteristics for Alvarado Park Reservoir are in Table 1.

Angler Access

Alvarado Park Reservoir's boat access consists of a single public boat ramp, and bank fishing access is limited to the public boat ramp area and park. The City of Alvarado successfully applied for a federal Boating Access Grant (F-273-B-1) administered through Texas Parks and Wildlife Department (TPWD), and renovation and construction was in progress as of March 2018. Additional boat ramp characteristics are in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Tibbs and Baird 2013) included:

1. Monitor the progress of the boat ramp application and subsequent renovation and provide input if needed.

Action: The City of Alvarado applied for a Boating Access Grant shortly after the 2013 report was written. Waco District staff reviewed the grant application by the end of 2014 and made it a high priority for the district. Grant F-273-B-1 to the City of Alvarado, Alvarado Park Lake Boat Ramp Agreement, was reviewed and signed on May 17, 2016, and is a current and active grant. Renovation and construction was in progress as of March 2018. The grant expires on June 30, 2018.
2. Investigate the possibility of the private purchase of Sunshine Bass by the City of Alvarado, issue a stocking permit to the City, and recommend a stocking rate of 10/acre if stocked. Evaluate stocking success during regularly scheduled gill netting surveys.

Action: The City of Alvarado has been contacted by phone and email numerous times since the 2013 report writing, but has shown little interest in purchasing Sunshine Bass.
3. Cooperate with the City of Alvarado to post and monitor AIS signage, educate the public about AIS through verbal and written means, make speaking points about AIS when presenting to local constituent and user groups, and keep track of existing and future inter-basin water transfers to facilitate potential AIS responses.

Action: Invasive species signage was posted at the Alvarado Park Reservoir access point during summer 2013. District biologists have made a speaking point about AIS,

how to prevent their spread, and potential effects on Alvarado Park Reservoir while speaking to business owners and constituent groups such as the Central Texas Flyrodders, Legacy Outfitters and Brazos River Sportsman's Club over the past several years. Interbasin water transfers are a permanent section in this report, and will be updated appropriately.

Harvest regulation history: Sport fishes in Alvarado Park Reservoir have always been managed with statewide regulations. Current regulations are found in Table 3.

Stocking history: Only a few stockings were conducted prior to 2000. 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 4.

Vegetation/habitat management history: No vegetation/habitat management actions have been performed on Alvarado Park Reservoir, and no problematic species of aquatic vegetation exist in the reservoir.

Water transfer: Alvarado Park Reservoir is used primarily for recreation and flood control. There are currently no permanent pumping stations on the reservoir. The City has no plans to sell water from the reservoir at this time.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Alvarado Park Reservoir (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad and Threadfin Shad were collected by daytime electrofishing (0.7 h at 8, 5-min stations). The 2017 survey is the first day-time electrofishing survey completed on Alvarado Park Reservoir. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Gill netting – Channel Catfish and White Bass were collected by gill netting (10 net nights at 10 stations). Catch per unit effort for gill netting was recorded as the number of fish caught per net night (fish/nn).

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified 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). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Habitat – The 2010 structural habitat survey was conducted according to Baird and Tibbs (2010). The Vegetation surveys were conducted using an adaptation of the point method during 2013 and 2017 (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Points were randomly generated on the shoreline and averaged a minimum of one point per shoreline mile. Aquatic vegetation has always been found close to the shore in Alvarado Park Reservoir, so stratifying the random points to exclude deep-water areas increased precision and resulted in better data.

Water level – There is currently no source for water level data for Alvarado Park Reservoir.

Results and Discussion

Habitat: Alvarado Park Reservoir is a eutrophic reservoir with a Secchi range generally less than two feet. A habitat survey was last conducted in 2010 (Baird and Tibbs; Table 6). A full vegetation survey conducted during summer 2017 found dominant shoreline vegetation to be bulrush (*scirpus spp.*), American water-willow (*Justicia americana*), cattail (*Typha spp.*) and common buttonbush (*Cephalanthus occidentalis*; Table 7).

Prey species: Threadfin and Gizzard Shad were collected with day-time electrofishing at 111.1/h and 147.0/h respectively in 2017 (Figure 1). The IOV for Gizzard Shad was poor as only 40% of the population was available to existing predators as forage; this was lower than the previous IOV estimate. Total CPUE of Gizzard Shad was considerably lower in 2017 compared to the previous two night-time surveys. Total CPUE of Bluegill in 2017 was similar to the two previous night-time surveys, as was size structure (Figure 2). Other forage species collected were Longear Sunfish, Redear Sunfish and Green Sunfish (Appendix A).

Catfishes: Channel Catfish were collected with gill nets at a rate of 15.2 fish/nn in 2018, nearly twice the previous catch rate for the species (Figure 3). The OBS goal for this species, general monitoring to collect abundance (CPUE – Total; RSE \leq 25) and size structure (PSD and length-frequency; N \geq 50) data, was achieved with 152 individuals and an RSE of 18. The PSD was good (i.e., 39) and suggests the population is well balanced between small and large fish (Figure 3). The percentage of legal-length fish (PSD-12; i.e., 12 inches) was also good (89) and similar to previous surveys; body condition for most Channel Catfish above 15 inches was excellent.

Blue Catfish and Flathead Catfish were not targeted during the 2018 gill net survey but were caught at rates of 0.4 and 0.5 fish/nn respectively (Appendix A).

White Bass: White Bass were collected with gill nets at a rate of 0.1 fish/nn in 2018, and this is the lowest catch rate on record (Figure 4). The OBS goal for this species, general monitoring to collect abundance (CPUE – Total; RSE \leq 25) and size structure (PSD and length-frequency; $N \geq$ 50) data, was not achieved as only one individual was collected. The three most recent White Bass catch rates are 26.0 fish/nn (2010), 1.0 fish/nn (2014) and 0.1 fish/nn (2018), and the historical average is 15.0 fish/nn (based on nine surveys dating back to 1990). This drop in catch rate might be explained by a loss of recruitment since there are no tributaries feeding the reservoir for White Bass to spawn in, and recent drought conditions (2011-2014) probably limited the availability of gravel bars and points thought to substitute as spawning areas within the reservoir. Anecdotal information from anglers and fishing forums also suggest this fishery has collapsed, at least temporarily.

Largemouth Bass: Largemouth Bass were collected by day-time electrofishing at a rate of 133.5 fish/h in 2017 and population indices were similar to the two previous night-time surveys (Figure 5). The OBS goal for this species, general monitoring to collect abundance (CPUE – Stock; RSE \leq 25) and size structure (PSD and length-frequency; $N \geq$ 50) data, was achieved with 89 individuals and an RSE of 16. The current PSD (58) is excellent and is higher than that of the previous two surveys; percentage of legal-length fish (PSD-14; i.e., 14 inches) is also higher than the previous two surveys indicating more available fish for angler harvest. Body condition ranged from good to excellent across size classes, but decreased in legal-length fish.

White Crappie: White Crappie were collected with gill nets at a rate of 3.3 fish/nn in 2018 (Appendix A). Although gill nets are not typically used to sample this species, there are no other good data for this species on Alvarado Park Reservoir. The status of this species will need to be reviewed during the next report cycle.

Fisheries Management Plan for Alvarado Park Reservoir, Texas

Prepared – July 2018

ISSUE 1: The City of Alvarado was awarded a Boating Access Grant in May 2016, but they haven't completed the project yet. The grant terminates on June 30th, 2018.

MANAGEMENT STRATEGY

1. Continue to communicate with the county and facilitate where possible.

ISSUE 2: Alvarado Park Reservoir is shallow and lacks woody fish habitat.

MANAGEMENT STRATEGIES

1. Work with partners to build and deploy new fish habitat structures into Alvarado Park Reservoir.
2. Utilize side scan sonar to monitor artificial fish habitat structure condition as needed.
3. Update fish attractor map and coordinates on the TPWD website as needed.
4. Utilize social media to describe the location(s) and benefits of the fish attractors to the fishery.

ISSUE 3: Many AIS 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 AIS are significant. Additionally, the potential for AIS 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 maintain appropriate signage at access points.
2. Provide technical support and informational materials for the state's "Clean, Drain, Dry" initiative.

ISSUE 4: Alvarado Park Reservoir historically had an excellent White Bass fishery however, a multi-year drought (2011 - 2014) combined with possible overharvest, appears to have seriously hurt the population. The three most recent samples had catch rates of 26.0 fish/nn (2010), 1.0 fish/nn (2014) and 0.1 fish/nn (2018); the historical average is 15.0 fish/nn. Anecdotal information from anglers and fishing forum reports also suggest that this fishery has collapsed.

MANAGEMENT STRATEGIES

1. Change the status of White Bass from an important sport fish to a sport fish with a low-density population in the next OBS Plan and during the next report cycle.
2. Work with the City of Alvarado to implement a Sunshine Bass stocking program similar to the one started with the City of Cleburne.
3. Consider performing management stockings of White Bass if applicable.

Objective-Based Sampling Plan and Schedule (2018–2022)

Important sport and forage fishes: Abundant and/or important sport fishes in Alvarado Reservoir include Largemouth Bass and Channel Catfish. Important forage fishes include Gizzard Shad, Threadfin Shad, Bluegill Sunfish and Longear Sunfish.

Sport fishes with low-density populations: Flathead Catfish, Blue Catfish, White Bass and crappie occur in low abundance in Alvarado Reservoir and are generally caught incidentally to targeted species. We will continue collecting and reporting data for these species, and upgrade their status if appropriate.

Survey objectives, fisheries metrics, and sampling objectives

Fall Electrofishing: This survey will be used to evaluate Largemouth Bass and primary forage species (Threadfin Shad, Bluegill Sunfish, Gizzard Shad and Longear Sunfish). Black Bass were the second-most sought species group by anglers in Alvarado Reservoir during the 2010 spring quarter creel survey (22.1% directed effort), and the popularity of bass fishing at this reservoir justifies sampling time and effort (Tibbs and Baird 2010). A minimum of 12, random five-minute day-time electrofishing stations will be sampled in fall 2021. The goals of the Largemouth Bass survey will be general monitoring (using CPUE, size structure and relative weight as metrics) to characterize the Largemouth Bass population and make comparisons with the fall 2017, and future, day-time electrofishing data. Catch per unit effort target precision will be an RSE < 25. Target sample size will be $N \geq 50$ stock-sized fish to determine population size structure, to calculate proportional size distributions with 80% confidence. If sampling objectives aren't achieved with the initial 12 stations of effort and if catch rates indicate collecting our size structure target is reasonable, sampling will continue at random stations until that target is reached.

The goals of the forage species surveys will be general monitoring (using CPUE and size structure as metrics) to characterize Bluegill Sunfish, Gizzard Shad and Longear Sunfish populations to enable comparisons with historical and future data. Since trend data show large variations in catch of forage species, no catch per unit effort target precision, target sample sizes or relative weights will be assigned. Index of Vulnerability (IOV) will be calculated for Gizzard Shad to assess the relative proportion of individuals in the population suitable as prey for sport fish.

Spring Gill Netting: The gill net survey will be used to evaluate Channel Catfish. Catfishes were the most sought species group by anglers in Alvarado Reservoir during the 2010 spring quarter creel survey with 33.6% of the directed effort. A minimum of 10 random gill netting stations will be sampled over-night in spring 2022. The goal of the gill netting survey will be general monitoring (using CPUE, size structure and relative weight as metrics) to characterize Channel Catfish populations and make comparisons with historical and future data. Catch per unit effort target precision will be an RSE < 25. Target sample size will be an $N \geq 50$ stock-sized fish to determine population size structure, to calculate proportional size distributions with 80% confidence. If sampling objectives aren't achieved with the initial 10 stations and if catch rates indicate collecting our size structure target is reasonable, sampling will continue at random stations until that target is reached.

Literature Cited

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Tables and Figures

Table 1. Characteristics of Alvarado Park Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	City of Alvarado
County	Johnson
Reservoir type	Tributary
Shoreline Development Index	1.5
Conductivity	363 μ S/cm

Table 2. Public boat ramp characteristics for Alvarado Park Reservoir, Texas, March, 2018. There is currently no source for water level data for Alvarado Park Reservoir.

Boat ramp	Latitude Longitude (dd)	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Alvarado	32.3828 -97.2518	15	N/A	Renovation in progress

Table 3. Harvest regulations for Alvarado Park 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 ^a	14-inch minimum
Bass: Spotted	5 ^a	None
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

^a Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination.

Table 4. Stocking history of Alvarado Park Reservoir, Texas. Life stages are fingerlings (FGL) 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	<u>180,038</u>		
Channel Catfish	1990	26,039	FGL	2.5
	Total	<u>26,039</u>		
Coppernose Bluegill	1983	27,000	UNK	UNK
	Total	<u>27,000</u>		
Florida Largemouth Bass	1997	50,857	FGL	1.3
	1998	51,495	FGL	1.5
	Total	<u>102,352</u>		

Table 5. Objective-based sampling plan components for Alvarado Park Reservoir, Texas 2017–2018.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	10 fish/inch group (max)
Bluegill ^a	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Redear Sunfish ^a	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Longear Sunfish ^a	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad ^a	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
	Prey availability	IOV	$N \geq 50$
<i>Gill netting</i>			
White Bass	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
	Condition	W_r	10 fish/inch group (max)
Channel Catfish	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
	Condition	W_r	10 fish/inch group (max)

^a No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill and Gizzard Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Survey of structural habitat types, Alvarado Park Reservoir, Texas, 2010. Survey was conducted using 2009 NAIP, 1-meter resolution satellite imagery. Shoreline habitat type units are in miles.

Habitat type	Estimate	% of total
Bulkhead	1.0	11.3
Rocky shoreline (rocks > 4 inches)	0.4	4.8
Natural shoreline	7.1	80.5
Boat docks/piers	0.3 acres	3.1

Table 7. Survey of aquatic vegetation, Alvarado Park Reservoir, Texas, 2013 and 2017. The data show percentages of randomly-selected points where species occurred. Water level was near full pool during the surveys.

Vegetation	2013	2017
Native emergent		
bulrush (<i>scirpus</i> spp.)	64% (16 of 25)	80% (20 of 25)
common buttonbush (<i>Cephalanthus occidentalis</i>)		12% (3 of 25)
cattail (<i>typha</i> spp.)	12% (3 of 25)	12% (3 of 25)
American water-willow (<i>Justicia americana</i>)	28% (7 of 25)	36% (9 of 25)

Gizzard Shad

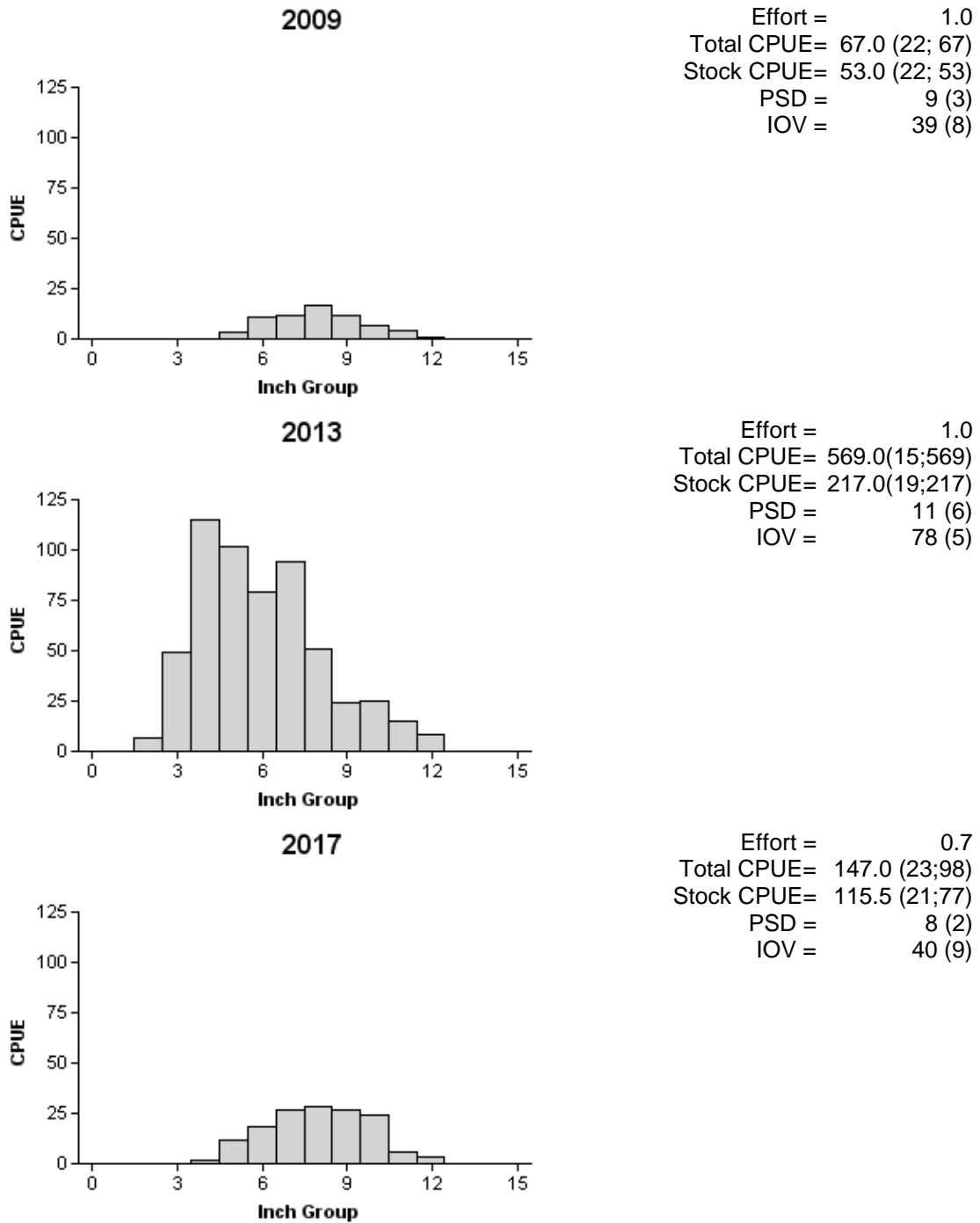


Figure 1. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Alvarado Park Reservoir, Texas, 2009 (night-time), 2013 (night-time), and 2017 (day-time).

Bluegill

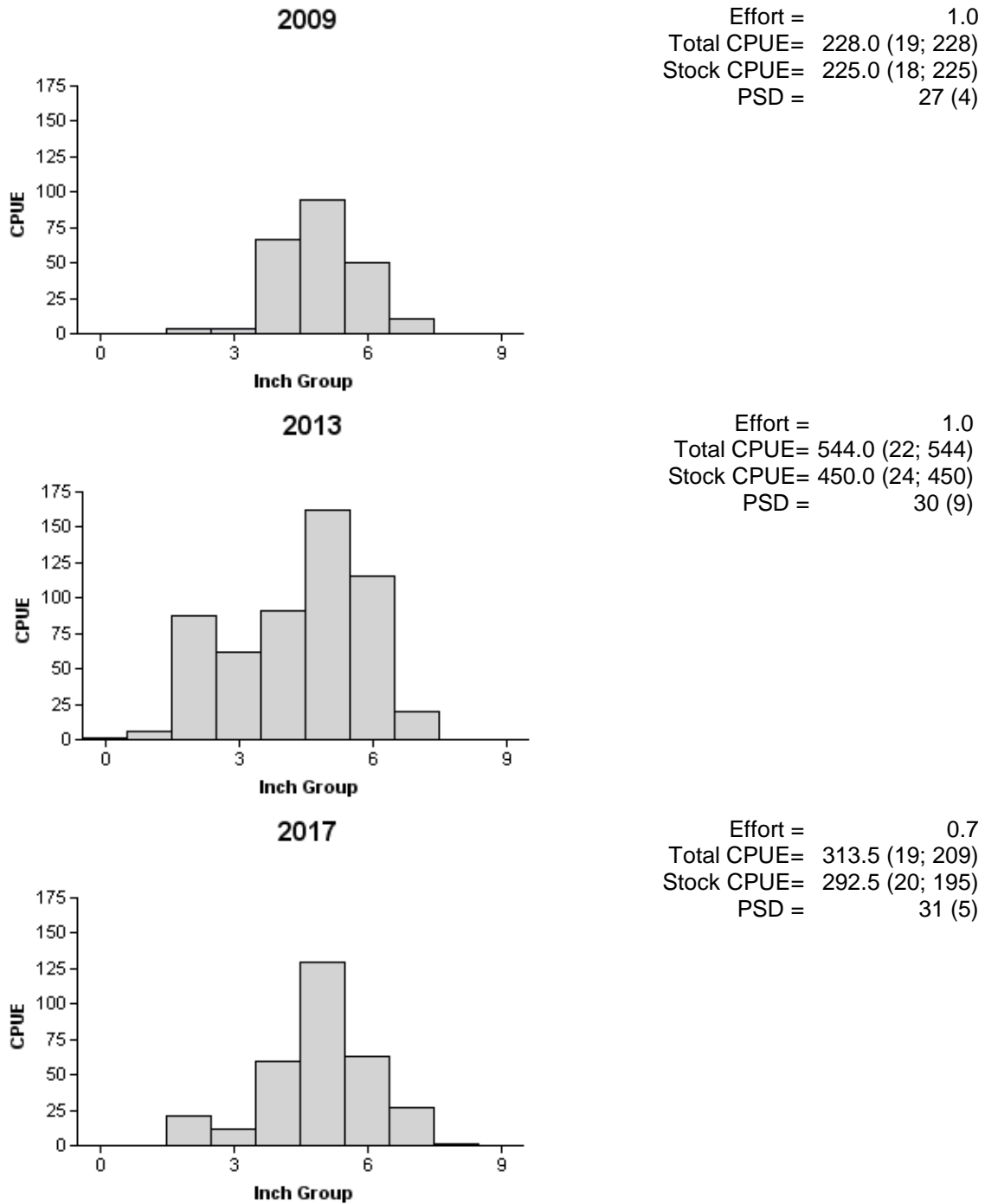


Figure 2. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Alvarado Park Reservoir, Texas, 2009 (night-time), 2013 (night-time), and 2017 (day-time).

Channel Catfish

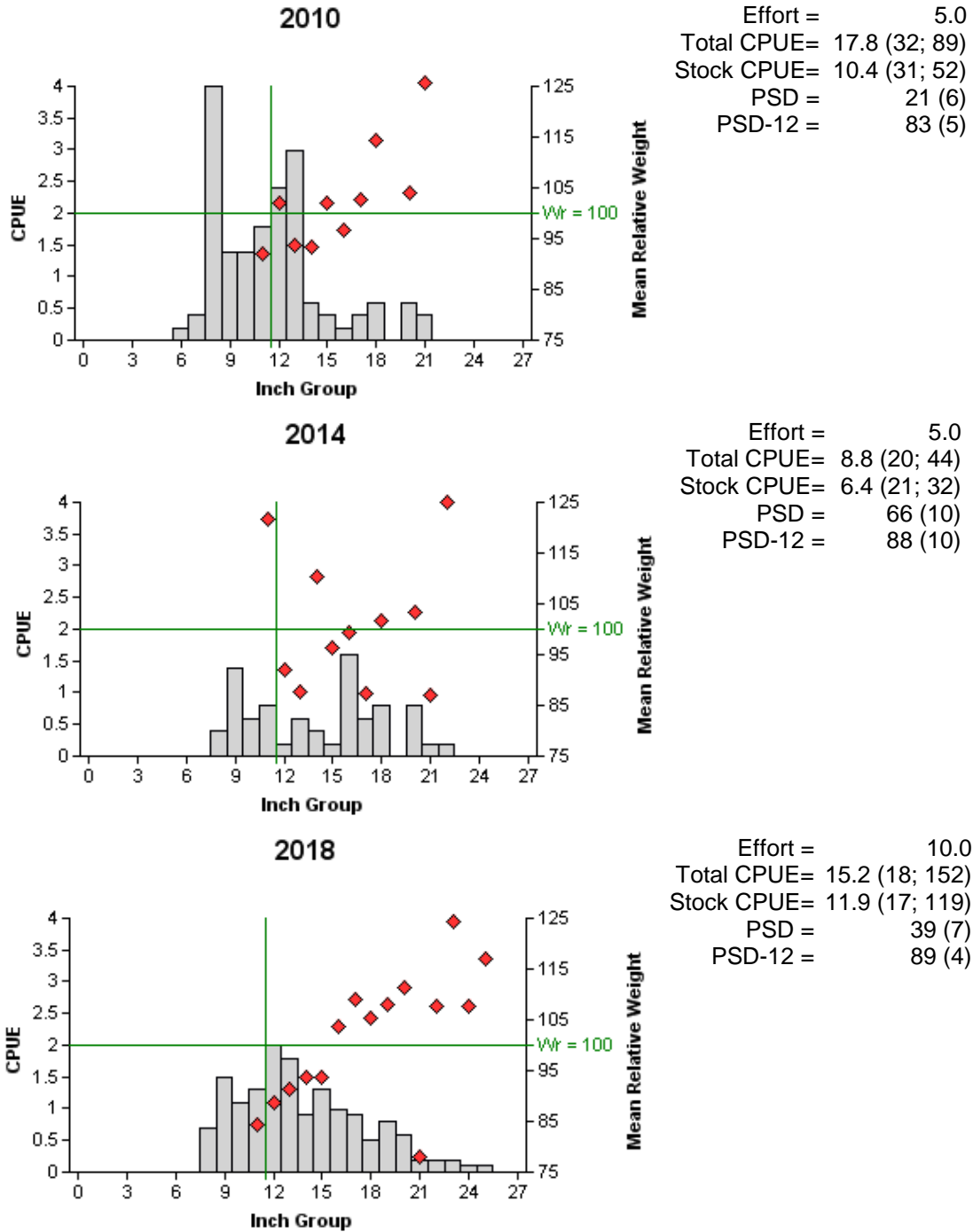


Figure 3. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Alvarado Park Reservoir, Texas, 2010, 2014, and 2018. Vertical line indicates minimum length limit and horizontal line represents optimal body condition.

White Bass

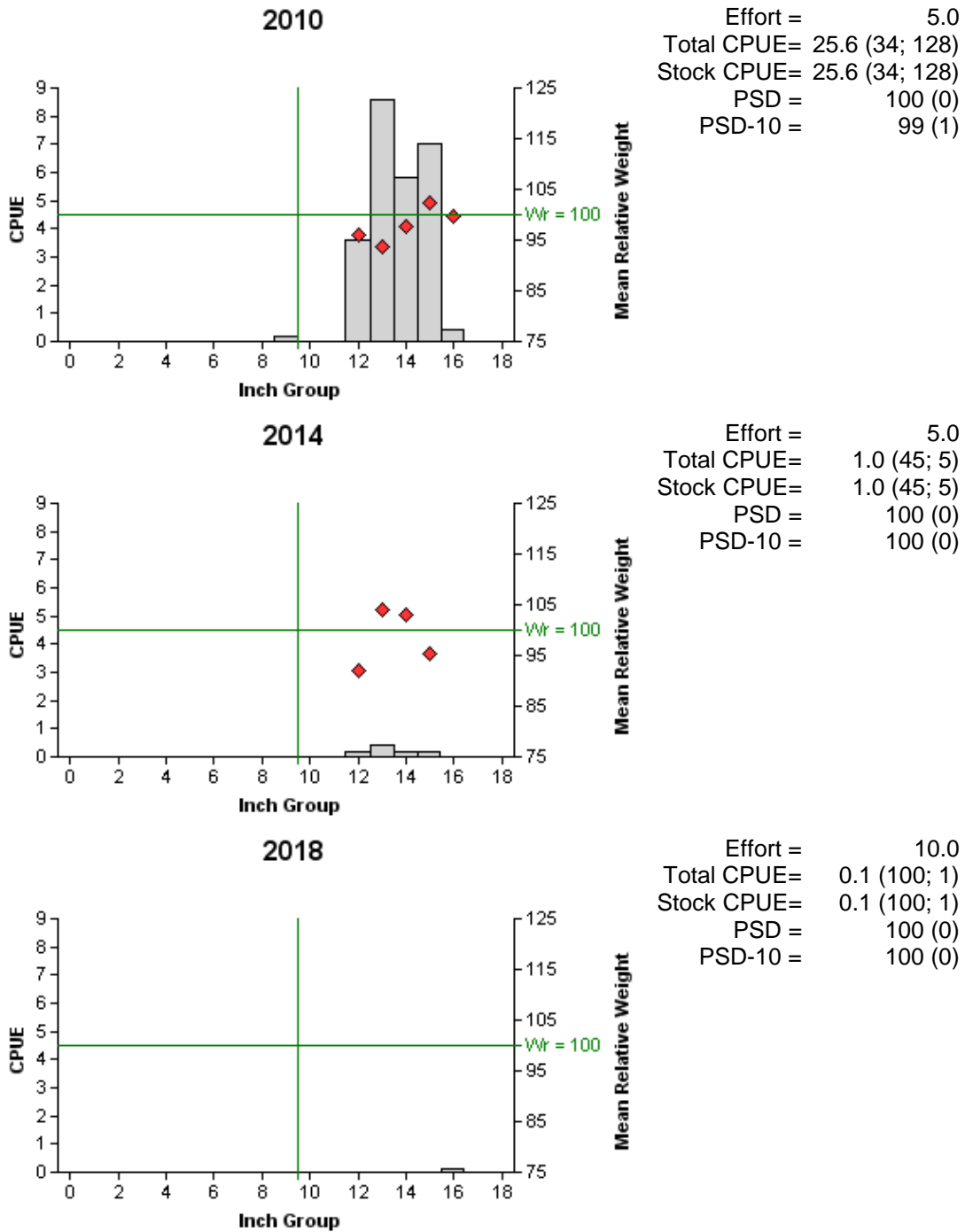


Figure 4. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Alvarado Park Reservoir, Texas, 2010, 2014, and 2018. Vertical line indicates minimum length limit and horizontal line represents optimal body condition.

Largemouth Bass

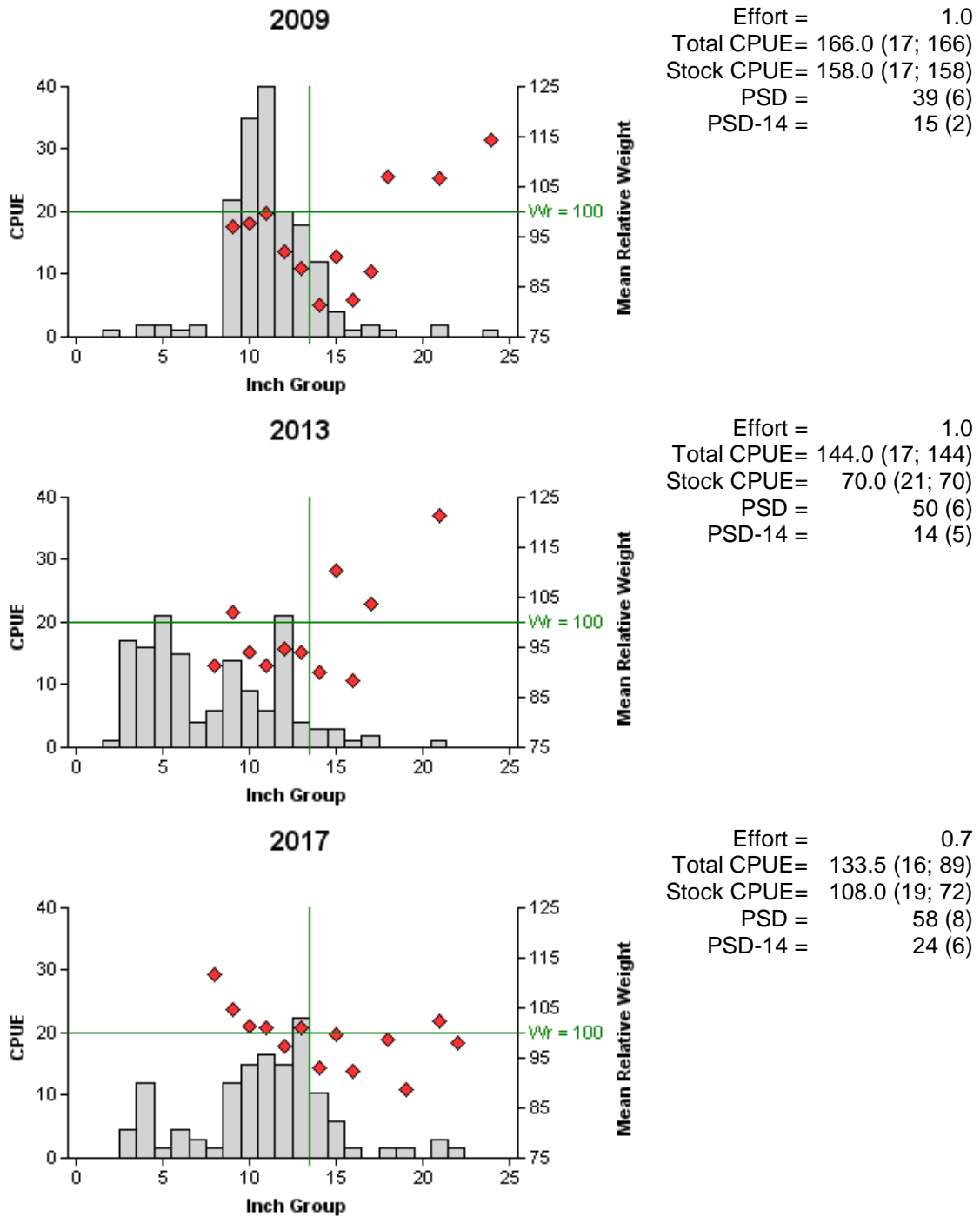


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Alvarado Park Reservoir, Texas, 2009 (night-time), 2013 (night-time), and 2017 (day-time). Vertical line indicates minimum length limit and horizontal line represents optimal body condition.

Table 8. Proposed sampling schedule for Alvarado Park Reservoir, Texas. Survey period is June through May. Electrofishing surveys are conducted in the fall while gill netting surveys are conducted in the spring. Standard survey denoted by S and additional survey denoted by A.

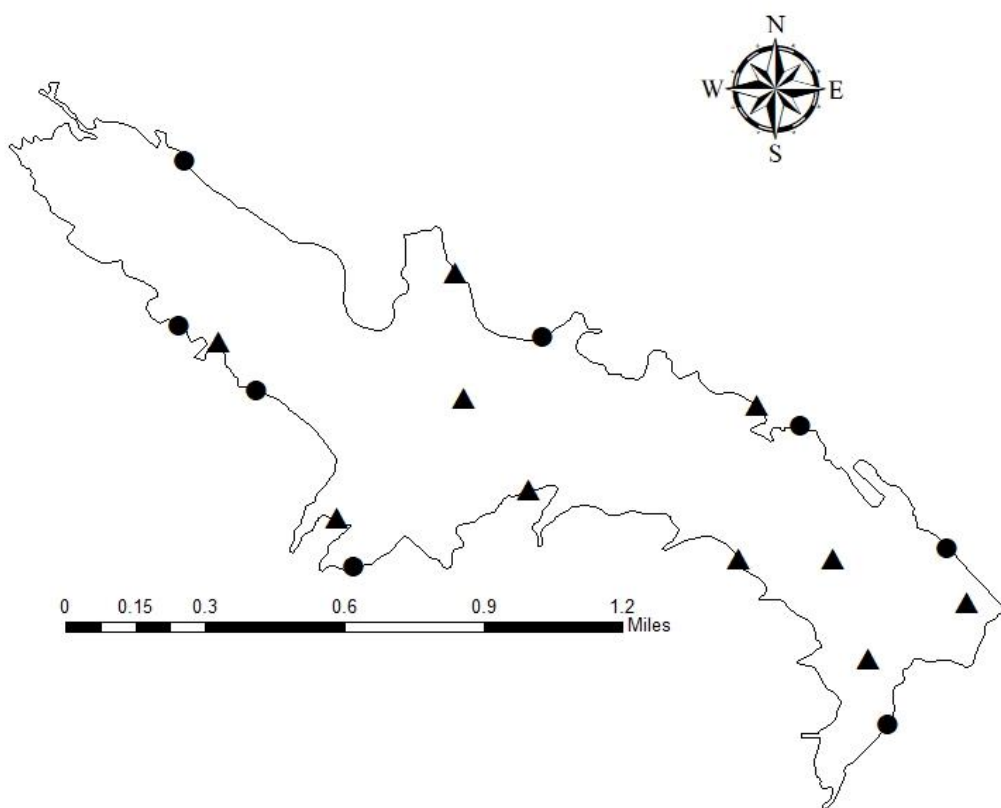
	Survey year			
	2018-2019	2019-2020	2020-2021	2021-2022
Angler access				S
Vegetation				S
Electrofishing – Fall				S
Gill netting				S
Report				S

APPENDIX A – Catch rates for all species from all gear types

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Alvarado Park Reservoir, Texas, 2017-2018. Sampling effort was 10 net nights for gill netting and 0.7 h for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			98	147.0 (23)
Threadfin Shad			74	111.1 (28)
Blue Catfish	4	0.4 (55)		
Channel Catfish	152	15.2 (18)		
Flathead Catfish	5	0.5 (68)		
White Bass	1	0.1 (100)		
Green Sunfish			5	7.5 (80)
Bluegill			209	313.5 (19)
Longear Sunfish			29	43.5 (62)
Redear Sunfish			5	7.5 (60)
Largemouth Bass			89	133.5 (16)
White Crappie	33	3.3 (30)		

APPENDIX B – Map of sampling locations



Location of sampling sites, Alvarado Park Reservoir, Texas, 2017-2018. Gill net and electrofishing stations are indicated by triangles and circles respectively. There is currently no source for water level data for Alvarado Park Reservoir, however water level was near full pool at the time of sampling.



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