Lake Athens

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 Lake Athens were surveyed in 2017 using electrofishing. Anglers were surveyed from June 2017 through May 2018 with a creel survey. 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: Lake Athens is a 1,799-acre reservoir on Flat Creek, a tributary of the Neches River approximately 5 miles east of Athens, Texas. Water level has not fluctuated more than 5 feet from conservation pool level since 2006. Lake Athens has high productivity. Habitat features consisted of standing timber, rocks, native aquatic plants and hydrilla.

Management History: Important sport fishes include sunfishes, Largemouth Bass, White Bass, Channel Catfish, and Black Crappie. The length limit for Largemouth Bass was changed in 1996 from the statewide 14-inch minimum length to a 14- to 21-inch slot-length limit. Monitoring of the Largemouth Bass growth rate has continued. Invasive aquatic plant species, hydrilla, water hyacinth, and alligatorweed have been present in the system historically and are under management by the controlling authority and TPWD. Giant salvinia and crested floating heart was identified in Lake Athens in early 2018 and is currently being managed by the TPWD AHE team as a tier I infestation.

Fish Community

- **Prey species:** Electrofishing catch of Bluegill was high and made up most of the forage base. Few Bluegill over 6-inches long were collected but they did support a limited fishery. Threadfin Shad and Gizzard Shad are present, but few Gizzard Shad were available as prey to most sport fish.
- **Largemouth Bass:** Largemouth Bass exhibited an excellent size distribution and fish longer than the protected size range of 14-21 inches were collected. Relative weight has stabilized and improved compared to previous years indicating good prey availability. Most anglers at Lake Athens targeted Largemouth Bass and total angling pressure per acre was like other high-quality fisheries.
- **Crappie:** Black Crappie continue to support an excellent fishery with relatively high angler catch and harvest rates.

Management Strategies: Continue stocking surplus Florida Largemouth Bass as available. Maintain the 14-21 – inch slot-size limit. Collect data on trophy-sized Largemouth Bass from the revised ShareLunker program; promote through social media and on the AMWA web site. Conduct annual vegetation surveys and cooperate with the controlling authority in vegetation management. Revise the Lake Athens Aquatic Vegetation Plan as necessary. Continue timely review of AVTPs. Maintain outreach regarding the negative impacts of aquatic invasive species.

Introduction

This document is a summary of fisheries data collected from Lake Athens 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

Lake Athens is a 1,799-acre reservoir constructed in 1962 on Flat Creek, a tributary of the Neches River, Texas, built to supply water and recreation. The lake is in Henderson County approximately 5 miles east of Athens, Texas and is operated and controlled by the Athens Municipal Water Authority (AMWA). Lake Athens was eutrophic, exhibiting a mean TSI chl-a of 49.5 (Texas Commission on Environmental Quality 2011). The shoreline at Lake Athens is primarily featureless or a combination of featureless/bulkhead and boat docks. A diverse native emergent and submersed aquatic plant community exists. Invasive aquatic plants, hydrilla *(Hydrilla verticillata)*, water hyacinth *(Eichhornia crassipes)*, and alligatorweed *(Alternanthera philoxeroides)* are present but coverage is minimal. Giant salvinia *(Salvinia molesta)* and crested floating heart (*Nymphoides cristata)* were identified in early 2018 and are under management. Following a drought from fall 2010 through spring 2014 water level has been stable, never dropping more than 1.5 feet below conservation pool (Figure 1). Other descriptive characteristics for Lake Athens are presented in Table 1.

Angler Access

Boat access is limited to two boat ramps at one access area (no fee required), and public bank angling is restricted to the marina area and bridge crossings; parking at bridge crossings is limited (Table 2). There are no handicap-specific facilities but the convenience pier at the ramp was re-constructed by (Athens Municipal Water Authority (AMWA) in 2017and provides for wheelchair use

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Norman and Ott 2014) included:

1. Continue monitoring Largemouth Bass *(Micropterus salmoides)* allele frequencies with microsatellite DNA analysis in fall of 2017 to monitor the impact of stockings; continue stocking FLMB fingerlings when surplus fish are available. Conduct additional electrofishing in 2015 and age & growth in 2017.

   Action: Changes in stocking criteria used to justify Florida Largemouth Bass *(M. s. floridanus)* FLMB stocking emphasized documented catches of > 8 lb. fish and de-emphasized genetic management. Changes in the ShareLunker program allowed anglers to submit a scale sample for spatial analysis of Largemouth Bass > 8 lb. potentially providing similar information. Therefore, no genetic sample was collected in 2017. Surplus FLMB fingerlings have not been available. Supplemental (Largemouth Bass only) electrofishing was conducted in fall 2015 and age-and-growth assessment of slot-length specimens was conducted in fall 2017.

2. Organize meetings to discuss the status of the Largemouth Bass fishery emphasizing intended purpose of the slot limit and the importance of harvesting legal, sub-slot fish.

   Action: Annual creel survey conducted from June 2017 through May 2018 was used as a mechanism to conduct outreach regarding harvest of small fish.

3. Conduct annual aquatic vegetation surveys; continue to release alligatorweed flea beetles *(Agasicles Hygrophila)* as necessary; continue reporting results of aquatic vegetation surveys and management to Lake Athens property owner's association (LAPOA).

   Action: Aquatic vegetation surveys were conducted annually as comprehensive or Aquatic Nuisance Species (ANS) surveys. Alligatorweed flea beetles were released in five locations in 2014. In February 2017 a public presentation was conducted to the Lake Athens Property Owners Association (LAPOA) to discuss the process for individual property owners or their agents to develop and implement Aquatic Vegetation Treatment Plans. In December 2017 a stakeholder committee was developed to formulate an Aquatic Vegetation Management Plan for Lake Athens to guide nuisance vegetation control by shore-front property owners.

4. Cooperate with the controlling authority and marina operator to post appropriate signage, regarding invasive species and Clean Drain Dry campaign.

   Action: Signage has been provided and posted. A rapid response was implemented the day after first discovery of giant salvinia in February 2018. Treatment of crested floating heart (*Nymphoides cristata)* is pending.

Harvest regulation history: From 1985 to 1995, Largemouth Bass were managed with a 14-inch minimum length limit. A 14- to 21-inch slot-length limit was implemented in 1996 to improve the population size structure and growth rates. All other sport fishes in Lake Athens are currently managed with statewide regulations (Table 3).

Stocking history: Initial stockings of Lake Athens began in 1973 with Channel Catfish *(Ictalurus punctatus)* fingerlings. Florida Largemouth Bass (FLMB) fingerlings were first stocked in 1978 at 3 fish/acre; however, their contribution to the population was presumably minimal. In 1993, FLMB fingerlings were stocked at a higher rate of 83 fish/acre. FLMB stockings were continued in most years through 2014. Walleye *(Sander vitreum)* and Blue Catfish *(I. furcatus)* were stocked, but they have not persisted. A complete stocking history is provided in Table 4.

Vegetation/habitat management history: Lake Athens has historically contained a stable, diverse aquatic macrophyte community primarily composed of native species. However, hydrilla, water hyacinth, and alligatorweed have all been identified within Lake Athens. Trace amounts of hydrilla were first discovered in 1995, and periodic herbicide treatments (funded by AMWA) were conducted in a limited area adjacent to the boat ramp. Water hyacinth was identified in 2005 and was manually removed by TPWD and AMWA personnel. Alligatorweed Flea Beetles were released by TPWD in 2010 and 2014 for alligatorweed control. Artificial structure includes twenty-two brush reefs were deployed with the help of the Athens Bass Club in January 2013.

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

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Athens (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 (*Lepomis spp.)*, Gizzard Shad *(Dorosoma cepedianum)*, and Threadfin Shad *(D. petenense)* were collected by electrofishing (1 hour at 12, 5-min stations). Catch

per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from 18 individuals in the mid-range of the protected slot-size limit (15.0-17.9 inches).

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.

Creel survey – An access-point creel survey was conducted from 2017 through 2018. The creel period was June through May. 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 2015).

Habitat – A structural habitat survey was conducted in 2001. Comprehensive vegetation surveys were conducted in 2013 and 2017, ANS surveys were conducted 2014-2016 (primarily to monitor status of alligatorweed and hydrilla). Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Water level – Source for water level data was the United States Geological Survey (USGS 2018) and water transfer data was provided by AMWA.

Results and Discussion

Habitat: A structural habitat survey was conducted in 2001 and consisted primarily of featureless shoreline, bulkhead, and boat docks (Ott & Bister, 2002). During the 2017 survey native vegetation occupied 20.5% of the reservoir and was within the target range of 20-40% recommended for optimal sport fish recruitment (Durocher et.al, 1984); and coverage by non-native vegetation was less than 0.5% (Table 7). Although total coverage of all vegetation was higher than 15% reported in 2013, following several years of drought, it is still below historical highs in 2011 and 2012. American lotus *(Nelumbo lutea)*, coontail *(Ceratophyllum demersum)*, pondweed *(Potamogeton spp.)* and wild celery (*Vallisneria Americana*) were the dominant species (Table 6). Hydrilla has been steadily declining in coverage from 123 acres in 2011 to <1 acre in 2017. Alligatorweed has declined in coverage from 28 acres in 2012 to 5 acres in 2017 possibly due to alligatorweed flea beetle releases in 2010 and 2014.

In December 2017 a stakeholder committee of property owner representatives, angler representatives, AMWA, and TPWD met to formulate an Aquatic Vegetation Management Plan to guide nuisance vegetation control by shore-front property owners. The plan is currently available to the public on the AMWA web site at: https://clevermuttportal.com/_amwa_media/2018%20vegetation%20management%20plan.pdf . Giant salvinia and crested floating heart were identified in 2018 and are currently being managed as a Tier I (attempted eradication) infestation by TPWD using a containment boom and herbicide applications.

Creel: Directed fishing effort was highest for Largemouth Bass (93.1%), followed by anything 5.0 % and crappie 2.7 %. Total fishing effort for all species was high and is indicative of the quality of the fishery; 78,365 angler hours (43.6 h/acre) in 2017-2018 (Table 9). Direct angler expenditures at Lake Athens was $557,300 (Table 9). Anglers reported traveling up to 1,000 miles to fish Lake Athens. However, most anglers live within a 100-mile radius of the reservoir (Appendix D).

Prey species: As is expected in a reservoir with abundant vegetation, sunfishes were the dominant prey group with an overall catch rate of 739/h in fall 2017 (Appendix A). Although both Gizzard Shad and Threadfin Shad were collected, catch rates were low for both species; 15/h and 65/h respectively. Furthermore, index of vulnerability (IOV) for Gizzard Shad was zero, indicating few, if any, were available to existing predators (Figure 2). Total CPUE of Bluegill *(Lepomis macrochirus)* in 2017 (610/h) was higher

than surveys in 2011 and 2013, and size structure continued to be dominated by specimens < 5 inch (Figure 3). Redear Sunfish *(L. microlophus)* and Redbreast Sunfish *(L. auritus)* were also collected but at lower abundance than Bluegill (Appendix A). Like Bluegill, size distribution of Redear Sunfish was dominated by specimens < 5 inch (Figure 4). Directed angling pressure for sunfishes was low (Table 8).

Largemouth Bass: Electrofishing catch rate of stock size (≥8 inch) Largemouth Bass in the 2017 survey continued to be high (91/h) and like 2013 and 2015 (77 and 113 respectively) (Figure 5). Size distribution was excellent (PSD = 65), similar to 2015 (68), and above that recorded in 2013 (45); furthermore, all three were within the target range of 40-70 proposed for a balanced population (Anderson 1980). Although Largemouth Bass larger than 21 inches are not commonly collected in electrofishing, specimens larger than the protected size range of 14-21 inches were collected in both last two surveys. Relative weights (Wr) were more consistent between size classes in 2017 than in previous surveys and did not exhibit the declining trend with length present in 2013.

Growth below the protected slot was average over the last three management reports. At 14 inches fish averaged 2.5, 2.3, and 2.8 years old in 2005, 2009 and 2013 respectively (Beck and Ott 2006, Bennett and Ott 2010, Norman and Ott 2014). Sagittal otoliths removed from 18 specimens (15.0-17.9 inches indicated that growth trajectory of male largemouth flattens by age 4; a 16.5-inch individual was the largest collected (Appendix C). However, the growth trajectory of female fish continued to increase through at least age 6; no older fish were aged.

Largemouth Bass were the primary species pursued by anglers (72,948 hours; 93.1% of the total effort) at Lake Athens during the annual creel survey (Table 10). Angler catch rate was 0.6/h, and included 66,085 fish < 4 lbs., 3,574 fish 4.0-6.9 lbs., 276 fish 7.0-9.9 lbs., and 81 fish ≥ 10.0 lbs. Similar to previous spring quarter only creel surveys (Ott and Norman 2013), 99.3 % of legal-sized Largemouth Bass caught during the 2017-2018 creel survey were released; only 286 were harvested (Figure 6).

Crappie: Crappie *(Pomoxis spp.)* accounted for an estimated 2,946 angler hours (1.6 h/acre) during the 2017-2018 Lake Athens creel survey and represented 2.7 % of the directed angler effort (Table 8). Catch rate for anglers targeting crappie was 1.6/h and annual harvest was an estimated 8,038 fish (Table 11). This was primarily a consumptive fishery and anglers reported releasing only 2.5% of the legal-length fish they caught. Size of harvested Black Crappie *(P. nigromaculatus)* ranged from 10 to 15 inches in total length (Figure 7).

Fisheries Management Plan for Lake Athens, Texas

Prepared – July 2018

ISSUE 1: Lake Athens has a history of producing trophy-sized Largemouth Bass. The current lake record (14.19 lbs.) was caught in 1988 and is likely the result of stockings of FLMB in the late 1970s and early 1980s. Two pure FLMB ShareLunkers (> 13 lbs.) were caught between 2013 and 2014; an additional four fish over 10 lbs. have been reported to the ShareLunker program since January 1, 2018 all validating the trophy potential of Lake Athens. Due to the proximity of TFFC Lake Athens routinely receives surplus Largemouth Bass of all size classes (fry, fingerling, adult) from the hatchery. The management goal for Largemouth Bass at Lake Athens is to maximize trophy potential and promote fishing opportunities.

MANAGEMENT STRATEGIES

1. Continue stocking FLMB fingerlings when surplus fish are available.
2. Maintain the current 14-21-inch slot-size limit.
3. Promote angler participation in the ShareLunker program through conventional media contacts and social media.
4. Inform the staff of Athens Municipal Water Authority about the ShareLunker program and request that links to the program be presented with reservoir information on the AMWA web site.

ISSUE 2: The diverse native aquatic plant community at Lake Athens (though beneficial) has led to conflicts between anglers and shorefront property owners. To reach a compromise a stakeholder committee comprised of anglers, property owners, AMWA, and TPWD developed an Aquatic Vegetation Management Plan specific to Lake Athens to guide treatment of littoral vegetation by property owners or their agents.

MANAGEMENT STRATEGIES

1. Make the results of the annual aquatic plant community surveys available on the AMWA web site.
2. Using the established stakeholder process review the Aquatic Vegetation Management Plan for Lake Athens on an annual basis (as necessary). Publish revisions on the AMWA web site.
3. In cooperation with AMWA continue to review Aquatic Vegetation Treatment Plans, as submitted, on a timely basis.

ISSUE 4: 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 and crested floating heart were documented at Lake Athens and herbicide treatment initiated in February 2018. This 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 controlling authority to post appropriate signage at access points around the reservoir. Maintain contact with AMWA regarding proposed Clean Drain Dry stencil for the boat ramp.
2. Follow up with AMWA regarding installation of a permanent floating barrier to minimize further introductions from the boat ramp to the main lake.
3. Continue assisting the AHE team in managing current exotic plant species treatments as necessary.
4. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers.
5. Educate the public about invasive species using social and conventional media.
6. Make a speaking point about invasive species when presenting to constituent groups.
7. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

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

Sport fishes in Lake Athens include Channel Catfish *(Ictalurus punctatus)*, White Bass *(Morone chrysops)*, Largemouth Bass and Black Crappie. Important forage species include sunfishes, and Threadfin and Gizzard Shad.

Low-density fisheries

White Bass have historically been very low in abundance and appear to be spawning habitat limited. Although this species may be caught opportunistically, it accounted for only 0.4 % of the directed effort in the 2004 spring quarter creel survey and no directed effort in 2014 or 2017/2018 surveys. Channel

Channel Catfish are present but are also recruitment limited and only represented 2.6% of the directed effort in the 2004 survey, 0.0% in 2014 and 0.1% in the 2017/2018 survey.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass support most of the directed angling effort at Lake Athens. Sampling precision (RSE) over the past three surveys (2013, 2014, and 2017) ranged from 26-17 and met program goals. The past two surveys have provided well over the desired 50 stock sized specimens to adequately estimate size distribution. Bootstrap analysis of the past two surveys predict reliable population metrics (CPUE; RSE<25, PSD and Wr; N>50 stock size individuals) could be obtained with 12 randomly selected five-minute electrofishing stations. Therefore, Largemouth Bass population trend data will be monitored in fall 2019 and 2021 for relative abundance, size distribution, condition and growth to determine large-scale changes in the population that may spur further investigation. A total of 12, five-minute electrofishing stations will be randomly generated and sampled. In 2021 thirteen fish between 13-14.9 inches will be selected from the survey and aged to determine the average age at the lower end of the protected slot. If a minimum of 13 specimens are not collected in the random stations additional (biologist selected) stations will be conducted to provide the extra fish; these specimens will not be included in estimates of size distribution or relative abundance. Unfortunately, electrofishing data typically

under-represent the abundance of Largemouth Bass greater than 21 inches in length. Therefore, ShareLunker entries in three weight classes (8.0-9.9; 10.0-12.9, and 13.0 lbs.), or where length was over 24 inches will be monitored annually to collect information on large specimens not commonly collected by electrofishing. The Largemouth Bass fishery will be assessed through a four-quarter access creel survey from June 2021 through May 2022 to monitor large-scale changes in angler effort, catch, harvest, and expenditures that may spur further investigation. Five weekend days and four weekdays will be surveyed in each quarter.

Prey species: Sunfishes, Threadfin Shad, and to a lesser extent, Gizzard Shad, are the primary forage species at Lake Athens. RSE for bluegill has been < 25 during the last three surveys based on 12 randomly selected five-minute stations. Due to historically stable electrofishing data, prey species will be sampled every four years starting in 2021 for continuation of trend information of relative abundance (CPUE) and size structure (PSD for sunfishes and IOV for Gizzard Shad). Sampling intensity will be the same as is proposed for Largemouth Bass.

Crappie: Trap net sampling was determined to be unreliable and was discontinued after 2005. A more cost-effective method is to monitor the fishery directly through an annual creel survey in 2021-2022 to determine large-scale changes in angler effort, catch, and harvest that may spur further investigation. Five weekend days and four weekdays will be surveyed in each quarter at the single public boat ramp on the reservoir.

Habitat: The quality of habitat resulting from the diverse native aquatic plant community at Lake Athens has led to excellent Largemouth Bass and Black Crappie fisheries. However, the same plant community has resulted in complaints of limited recreational access by shorefront property owners. To reach a compromise between angler and property owner interests, a stakeholder committee of anglers, property owners, AMWA, and TPWD was convened in fall 2017 to develop an Aquatic Vegetation Management Plan specific to Lake Athens to guide treatment of littoral vegetation by property owners or their agents. Annual surveys are needed to monitor changes to the aquatic plant community. Each summer the reservoir will be circumnavigated, and all species will be identified and geo-located.

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Tables and Figures

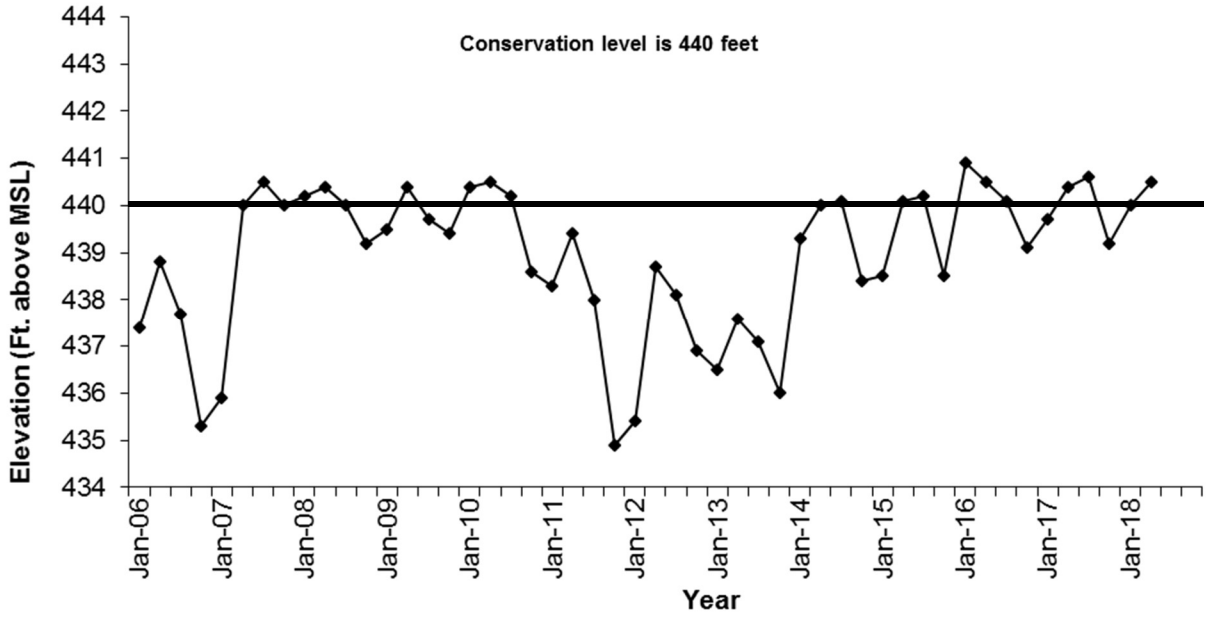


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Athens, Texas.

Table 1. Characteristics of Lake Athens, Texas.

Characteristic	Description
Year constructed	1962
Controlling authority	Athens Municipal Water Authority
Counties	Henderson
Reservoir type	City lake
Shoreline Development Index (SDI)	1.8
Conductivity	80 umhos/cm

Table 2. Boat ramp characteristics for Lake Athens, Texas, August 2018. Reservoir elevation at time of survey was 440.4 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Marina	32.21609 -95.76980	Y	60	432.0	Excellent, no access issues

Table 3. Harvest regulations for Lake Athens, Texas.

Species	Bag Limit	Length limit
Catfishes: 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] (no more than 1 > 21 inches)	14- to 21-inch slot
Crappies: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

[a] Daily bag for Largemouth Bass, Spotted Bass, and Guadalupe Bass = 5 fish in any combination.

Table 4. Stocking history of Lake Athens, Texas. FGL = fingerling; ADL = adults.

Species	Year	Number	Size
Blue Catfish	1987	15,117	FGL
Channel Catfish	1973	5,500	FGL
Largemouth Bass	1982	25	ADL
Florida Largemouth Bass	1978	6,000	FGL
	1982	627	ADL
	1993	149,670	FGL
	1995	190	ADL
	1996	91,934	FGL
	1997	155,184	FGL
	1998	151,055	FGL
	1999	31	ADL
	2000	253	ADL
	2003	10,041	FGL
	2004	76,955	FGL
	2004	292,159	FRY
	2005	90,022	FGL
	2005	87,643	FRY
	2008	91,196	FGL
	2009	46,063	FRY
	2009	180,524	FGL
	2010	31,200	FRY
	2011	690,740	FRY
	2011	15	ADL
	2012	183,130	FGL
	2012	109,809	FRY
	2014	849,667	FRY
	Total	3,294,108	
ShareLunker Largemouth	2014	18,588	FGL
Walleye	1978	6,000,050	FRY
	1979	4,581,680	FRY
	1980	6,688,000	FRY
	Total	17,269,730	

Table 5. Objective-based sampling plan components for Lake Athens Texas 2017-2018

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at mid-length of protected slot limit	N ≥13, 15.0 – 17.9 inches
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	N = 30, any age
Bluegill [a]	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad [a]	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50

[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. Comprehensive surveys of aquatic vegetation, Lake Athens, Texas, 2011–2013 & 2017. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Year	2011	2012	2013	2017
Reservoir area during survey	1,539	1,658	1,392	1,790
Native submersed				
Pondweed	27 (1.7)		31 (2.2)	57 (3.2)
Coontail	490 (31.8)	525 (32.6)	25 (1.8)	109 (6.1)
Wild celery	40 (2.6)	1 (<0.1)	24 (1.7)	53 (3.0)
Chara (alga)	39 (2.5)		25 (1.8)	19 (1.1)
Lyngbya (alga)			1 (<0.1)	
Native floating-leaved				
American Lotus	20 (1.3)	39 (2.4)	90 (6.4)	117 (6.5)
White water-lily	7 (0.5)	6 (<0.1)	2 (<0.1)	3 (0.2)
Native Emergent				
Cattail			<1 (<0.1)	
Giant cutgrass				2 (0.1)
Water primrose			<1 (<0.1)	
Panic grasses				1 (<0.1)
Water willow			<1 (<0.1)	1 (<0.1)
Non-native				
Alligator weed (Tier II) *	<1.0 (<0.1)	28 (1.7)		5 (0.3)
Hydrilla (Tier II) *	123 (8.0)	10 (0.6)	<1 (<0.1)	1 (<0.1)
Total (% coverage)	746 (48.5)	647 (39.0)	215 (15.4)	368 (20.6)

*Tier I is immediate Response, Tier II is management status, Tier III is Watch Status

Table 7. Surveys of aquatic nuisance vegetation species. Lake Athens, 2014 – 2016. Surface area (acres) is listed by plant species with percent of total reservoir surface area occupied in parentheses.

Year	2014	2015	2016
Reservoir area during survey	1,799	1,799	1,799
Alligator weed (Tier II) *	25 (1.4)	10 (0.5)	4 (0.2)
Hydrilla (Tier II) *	Tr.	Tr.	0.3 (Tr.)
Total (% coverage)	NA	NA	NA

*Tier I is immediate Response, Tier II is management status, Tier III is Watch Status

Table 8. Percent directed angler effort by species for Lake Athens, Texas, 2017–2018. Survey periods were from 1 June through 31 May.

Species	2017/2018
Channel Catfish	0.1
Sunfishes	0.4
Largemouth Bass	93.1
Crappie	2.7
Anything	5.0

Table 9. Total fishing effort (h) for all species and total directed expenditures at Lake Athens, Texas, 2017-2018. Survey periods were from 1 June through 31 May. Relative standard error is in parentheses.

Creel statistic	2017/2018
Total fishing effort	78,365 (15)
Total directed expenditures	$ 557,300 (32)

Gizzard Shad

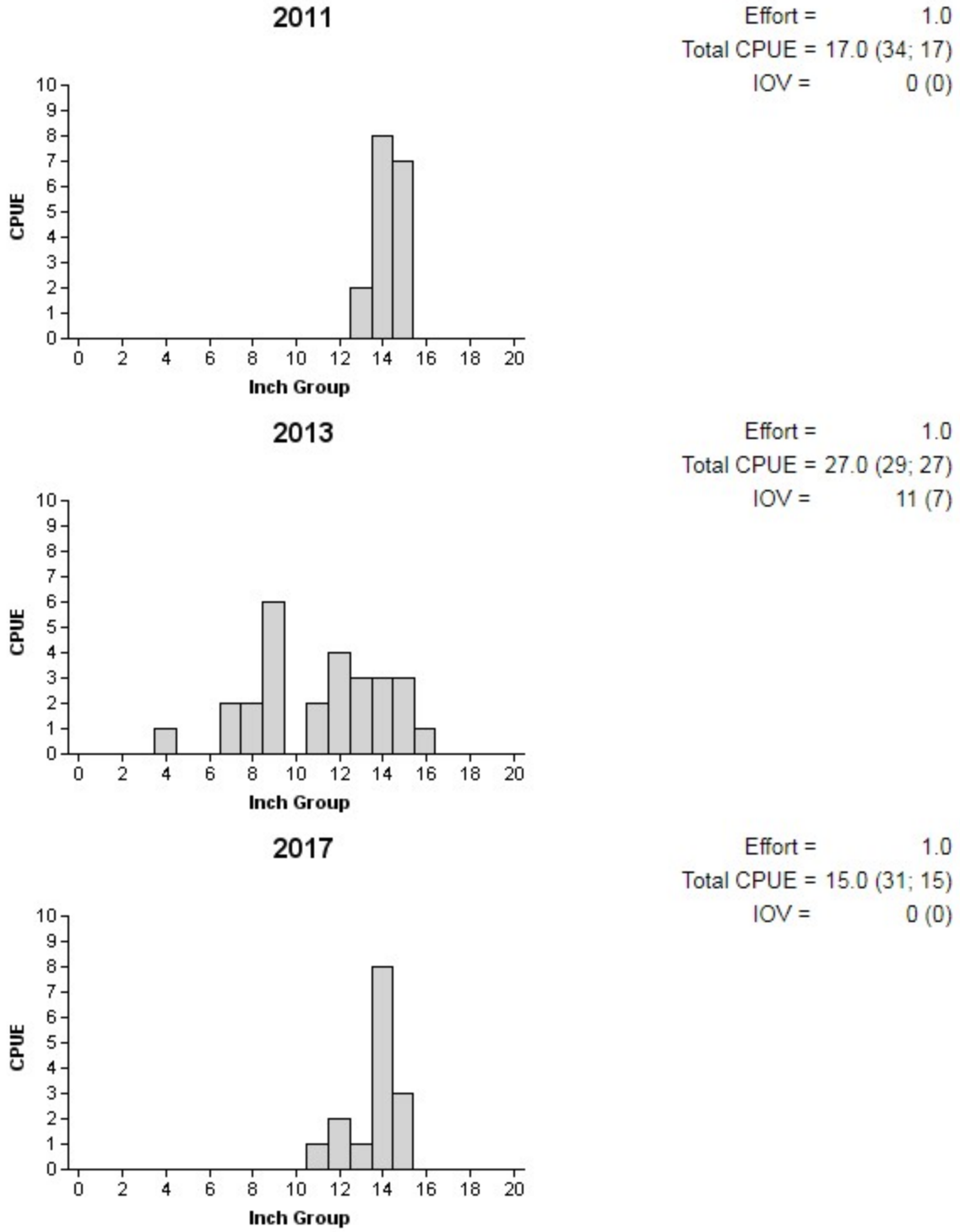


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2011, 2013, and 2017.

Bluegill

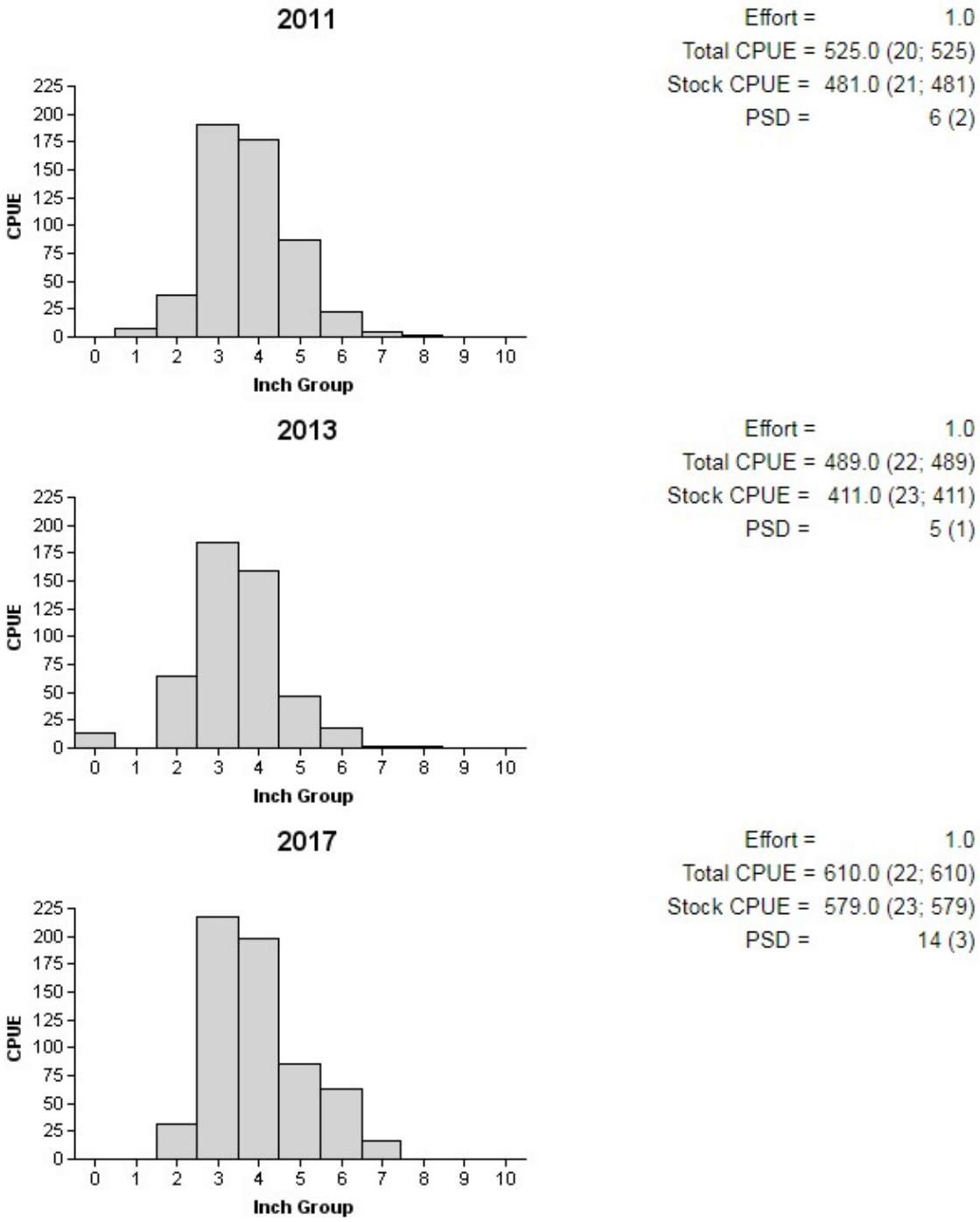


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2011, 2013, and 2017.

Redear Sunfish

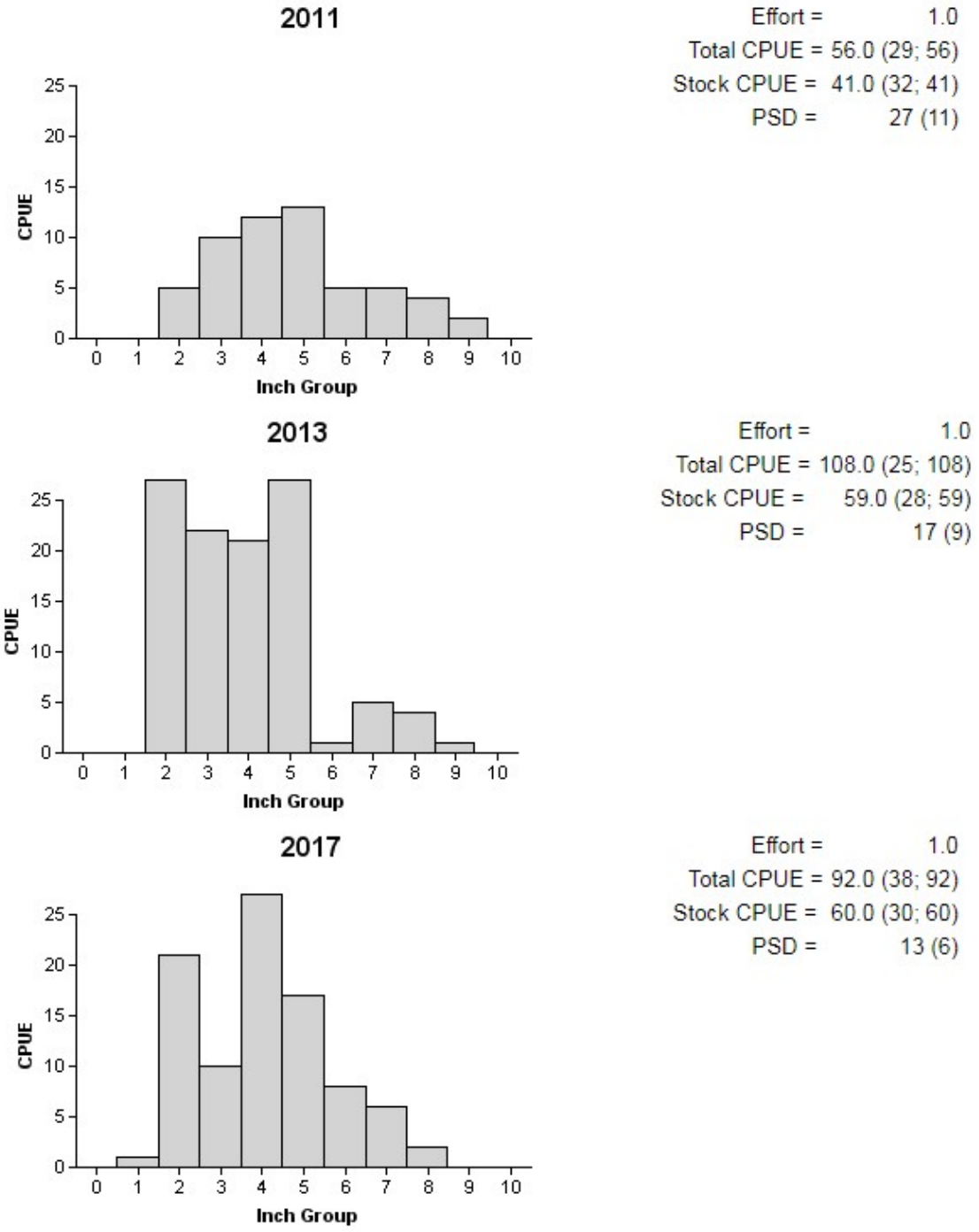


Figure 4. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2011, 2013, and 2017.

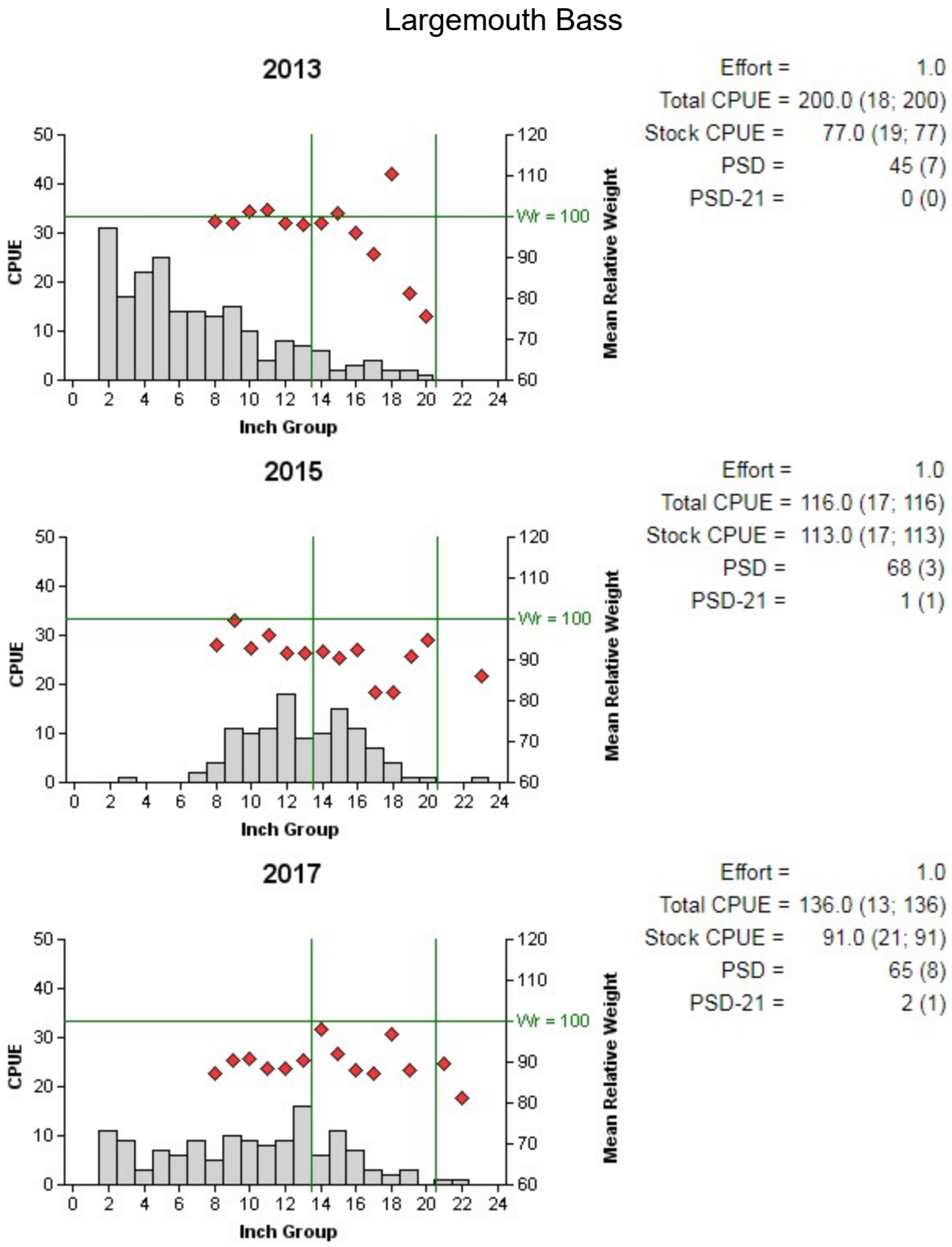


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2013, 2015, and 2017.

Table 10. Creel survey statistics for Largemouth Bass at Lake Athens, Texas, from June 2017 through May 2018. Catch rate is for all anglers targeting Largemouth Bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2017/2018
Surface area (acres)	1,799
Directed angling effort (h)	
Tournament	7,664 (33)
Non-tournament	65,264 (17)
All black bass anglers combined	72,928 (16)
Angling effort/acre	40.5 (17)
Catch rate (number/h)	0.6 (30)
Harvest	
Non-tournament harvest	286 (84)
Harvest/acre	0.2 (84)
Tournament weigh-in and release	0 (NA)
Release by weight	
<4.0 lbs.	66,085 (47)
4.0-6.9 lbs.	3,574 (67)
7.0-9.9 lbs.	276 (108)
≥10.0 lbs.	81 (234)
Percent legal released	99.3

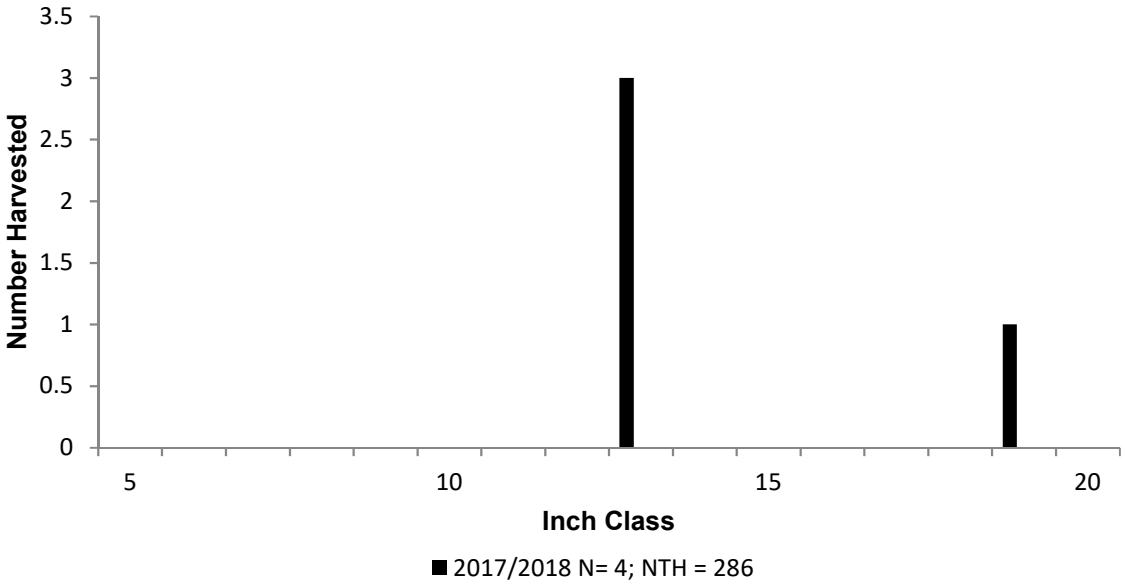


Figure 6. Length frequency of non-tournament harvested Largemouth Bass observed during creel surveys at Lake Athens, Texas, June 2017 through May 2018, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and NTH is the estimated non-tournament harvest for the creel period

Black Crappie

Table 11. Creel survey statistics for Black Crappie at Lake Athens, Texas, from June 2017 through May 2018. 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 2017/2018
Surface area (acres)	1,799
Directed effort (h)	2,946 (47)
Directed effort/acre	1.6 (47)
Total catch per hour	1.6 (25)
Total harvest	8,038 (86)
Harvest/acre	4.5 (86)
Percent legal released	2.5

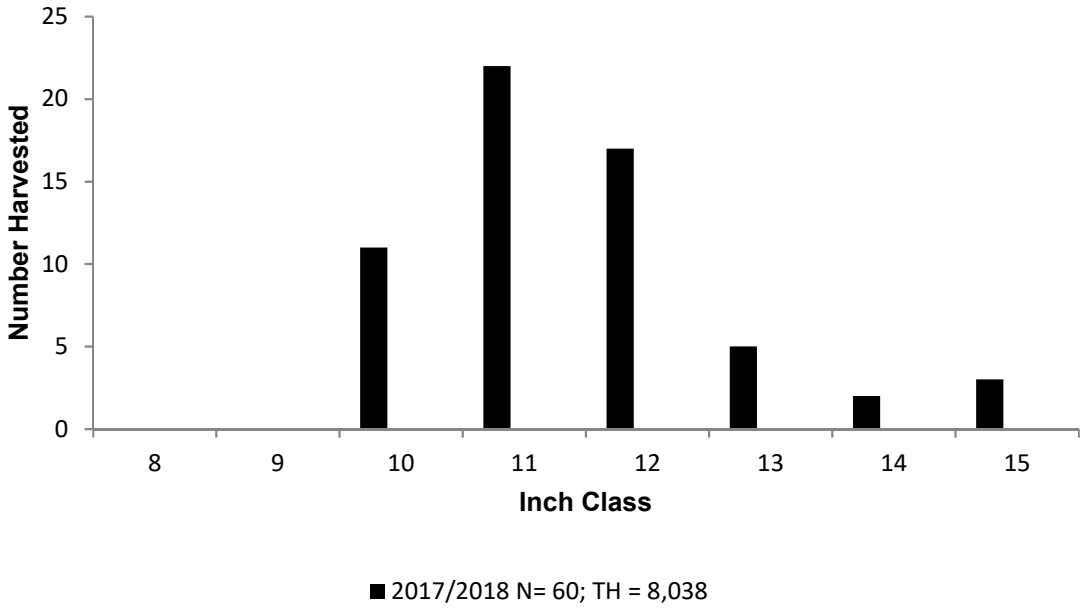


Figure 7. Length frequency of harvested Black Crappie observed during creel surveys at Lake Athens, Texas, June 2017 through May 2018, all anglers combined. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Proposed Sampling Schedule

Table 12. Proposed sampling schedule for Lake Athens, 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

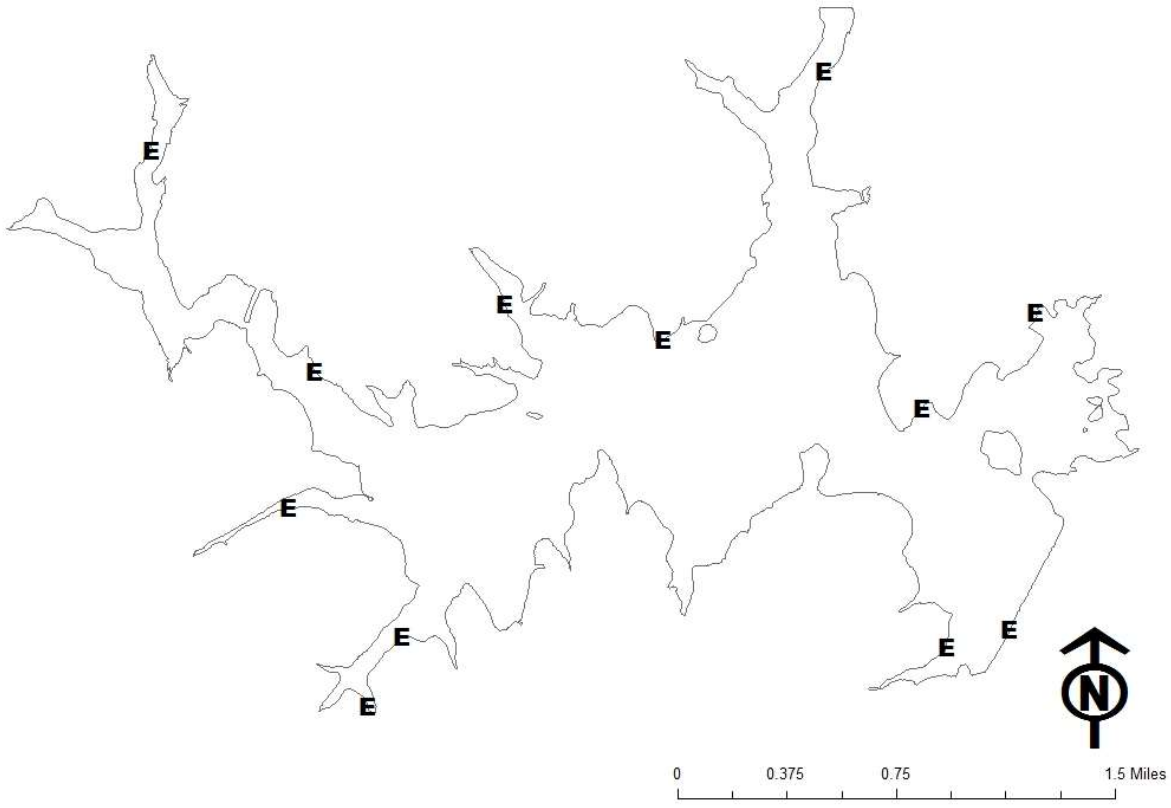
Sample Type	Survey year			
	2018-2019	2019-2020	2020-2021	2021-2022
Angler Access				S
Structural Habitat				S
Vegetation	A	A	A	S
Electrofishing – Fall		A		S
Creel survey				A
Report				S

APPENDIX A

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected by electrofishing from Lake Athens, Texas, 2017. Sampling effort was 1 hour.

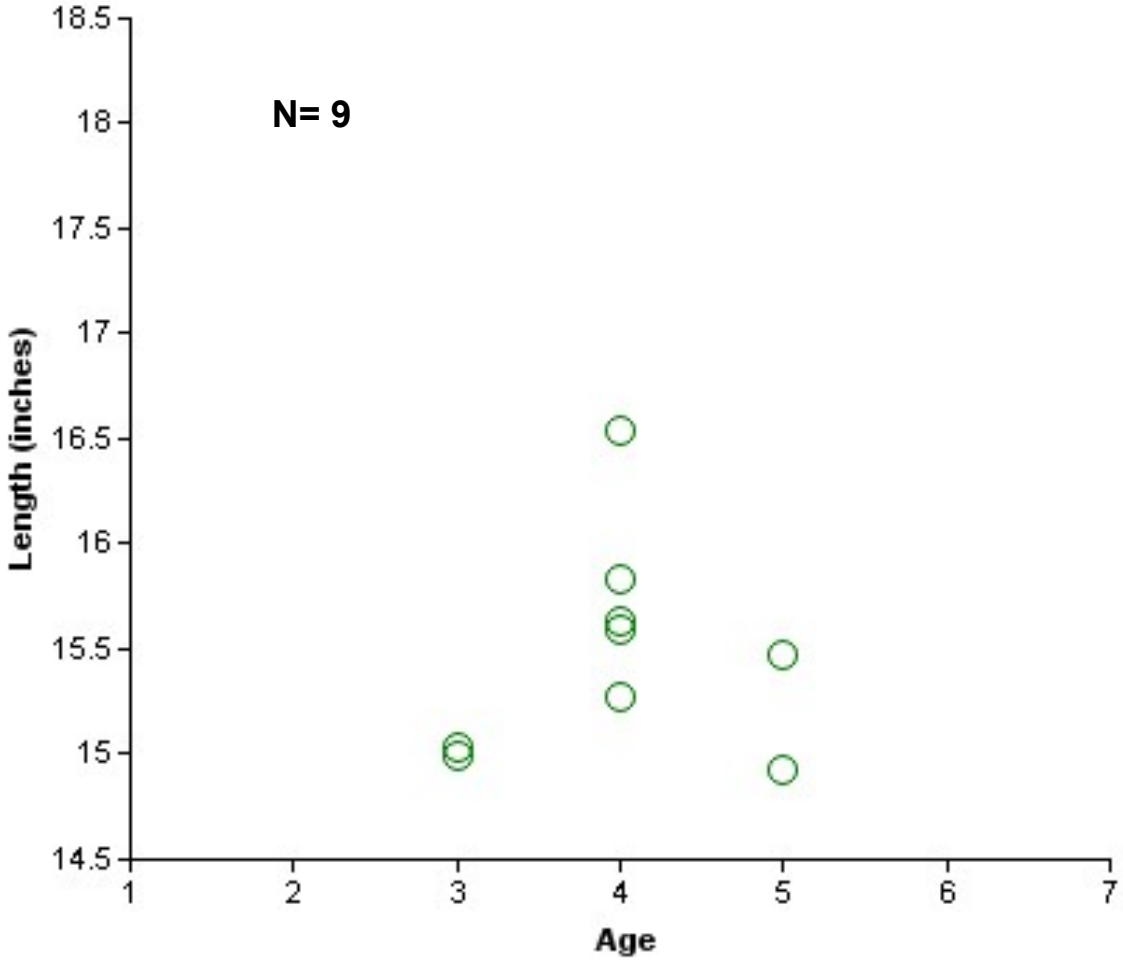
Species	Electrofishing	
	N	CPUE
Gizzard Shad	15	15 (31)
Threadfin Shad	65	65 (76)
Redbreast Sunfish	24	24 (64)
Warmouth	9	9 (50)
Bluegill	610	610 (22)
Longear Sunfish	3	3 (72)
Redear Sunfish	92	92 (38)
Redspotted Sunfish	1	1 (100)
Largemouth Bass	136	136 (13)

APPENDIX B

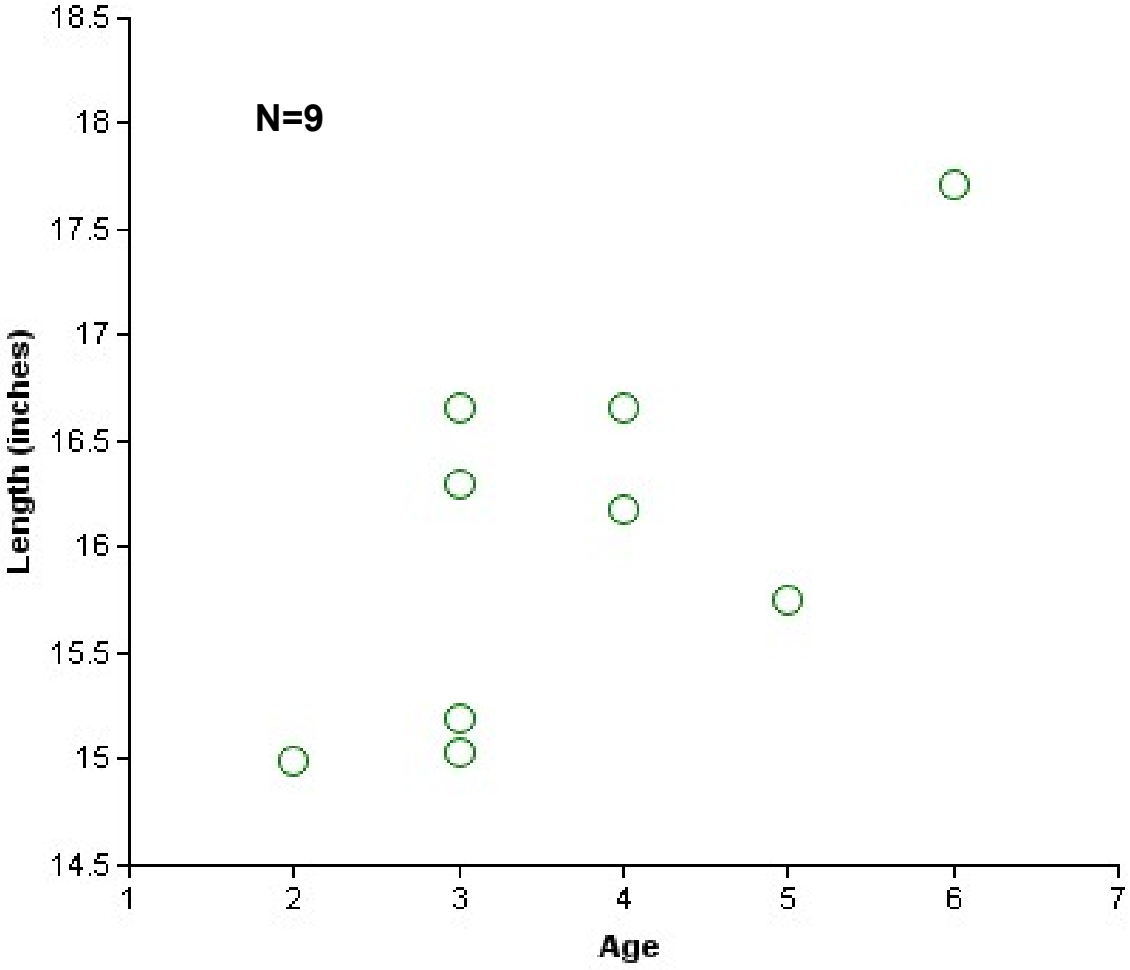


Location of sampling sites, Lake Athens, Texas, 2017-2018. Electrofishing stations are indicated with an E. Water level was at full pool at time of sampling.

APPENDIX C

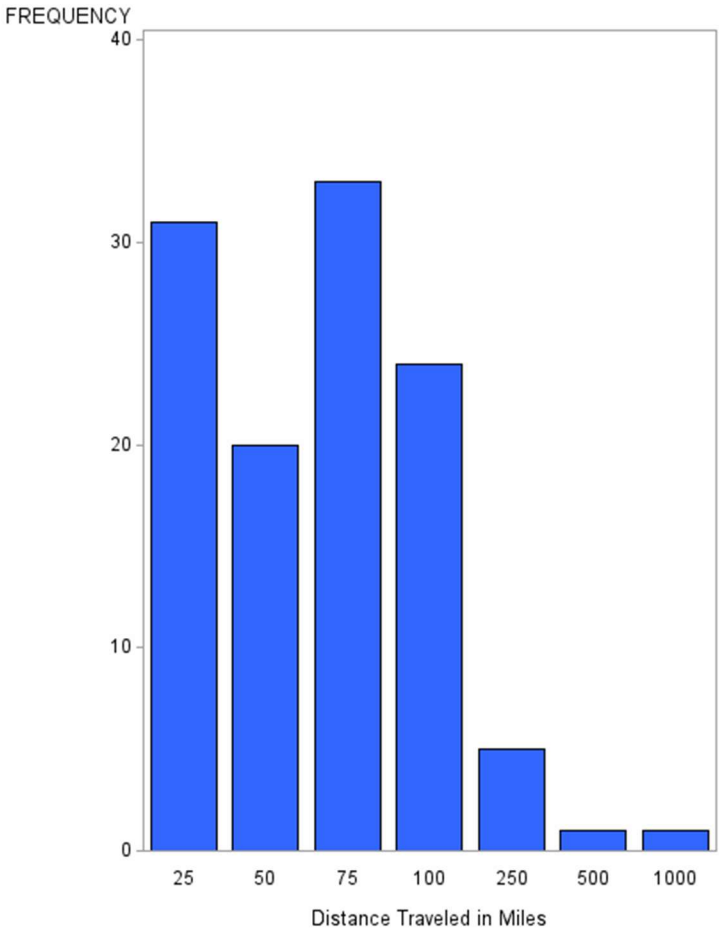


Length at age for male Largemouth Bass 15.0-17.9 inches collected by fall electrofishing at Lake Athens, Texas, October 2017.



Length at age for female Largemouth Bass 15.0-17.9 inches collected by fall electrofishing at Lake Athens, Texas, October 2017.

APPENDIX D



Percent frequency of anglers that traveled various distances (miles) to Lake Athens, Texas, as determined from the June 2017 through May 2018 creel survey.

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