

Big Creek Reservoir

2019 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Big Creek Reservoir were surveyed in 2019 using electrofishing and hoop netting. An aquatic vegetation survey was conducted during summer 2019. Historical data are presented with the 2019 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: Big Creek Reservoir is a 520-acre impoundment located on Big Creek in the Sulphur River Basin approximately 1 mile north of Cooper, Texas. Primary water uses include municipal water supply and recreation. Big Creek Reservoir has moderate productivity. Habitat features consisted of natural shoreline, standing timber and smartweed.

Management History: Important sport fish include Largemouth Bass and Channel Catfish. The management plan from the 2016 survey report included stocking Blue Catfish at 100 fish/acre in both 2017 and 2018; stocking only occurred in 2017. Recent efforts to improve fish habitat have included planting American waterwillow and giant bulrush.

Fish Community

- **Prey species:** Electrofishing catch of Gizzard Shad was moderate, and most were available as prey to most sport fish. Electrofishing catch of sunfish was very low and all were less than 6-inches long.
- **Catfishes:** Channel Catfish were abundant; fish up to 22 inches were collected. Many fish were legal size and available to anglers. The majority of Channel Catfish were thin suggesting prey limitation and potential overcrowding. Blue Catfish have been periodically stocked, most recently in 2017. Very few Blue Catfish have been collected suggesting poor survival from previous stockings.
- **Largemouth Bass:** Catch of Largemouth Bass was very low. Few legal-size fish were available to anglers. The low catch of Largemouth Bass is most likely due a combination of limited littoral habitat, sedimentation and poor water quality.

Management Strategies: Promote the potential Channel Catfish fishing opportunities through district Facebook page. Continue to manage all sport fish with statewide regulations.

Introduction

This document is a summary of fisheries data collected from Big Creek Reservoir in 2019. 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 fish was collected, this report deals primarily with major sport fish and important prey species. Historical data are presented with the 2019 data for comparison.

Reservoir Description

Big Creek Reservoir is a 520-acre impoundment constructed in 1987 on Big Creek in the Sulphur River Basin. It is located in Delta county approximately 1 mile north of Cooper, Texas, and is operated and controlled by the city of Cooper. Primary water uses include municipal water supply and recreation. Big Creek Reservoir was eutrophic with a mean TSI cl-a of 55.94 (Texas Commission on Environment Quality 2020). The reservoir has been drastically impacted by siltation resulting in high turbidity, limited littoral habitat and poor spawning substrate for fish. Approximately 20% of the reservoir's upper end is difficult to access at full pool due to sedimentation. Habitat at time of sampling consisted of natural shoreline and smartweed. Other descriptive characteristics for Big Creek Reservoir are in Table 1.

Angler Access

Big Creek Reservoir has one public boat ramp. Additional boat ramp characteristics are in Table 2. Shoreline access is available at the public park and fishing pier.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Storey 2016) included:

1. Improve littoral habitat by planting American waterwillow.

Action: Waterwillow was planted in 2017 but none was observed during the 2019 vegetation survey.

2. Stock Blue Catfish fingerlings in 2017 and 2018.

Action: Blue Catfish were stocked in 2017 but were not available in 2018.

Harvest regulation history: Sport fish in Big Creek Reservoir are managed under statewide regulations (Table 3).

Stocking history: Florida Largemouth Bass were initially introduced into Big Creek Reservoir in 1989 and 1990, then again from 1998-2000 and most recently in 2007. Blue Catfish were introduced in 1988 and Channel Catfish were introduced in 1989 and stocked again in 1991. The complete stocking history is in Table 4.

Water transfer: No interbasin transfers exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Big Creek Reservoir (Storey 2016). Primary components of the OBS plan are listed in Table 5. All surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by fall daytime electrofishing (1.0 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.

Tandem hoop nets – Channel Catfish were collected using 6 tandem hoop-net series at 6 stations. Nets were baited with soap and deployed for 2-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series).

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 – A vegetation survey was conducted in 2019. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Results and Discussion

Habitat: In 2003, total aquatic vegetative cover was estimated at 37% consisting primarily of American lotus (22%) and Eurasian watermilfoil (10%). By 2015 only native emergent vegetation was found and occupied less than 3% of the reservoir's surface area. Habitat in 2019 consisted primarily of smartweed (4%) and water primrose (0.3% acres; Table 6). A structural survey was conducted in 2007 (Jubar and Storey 2008).

Prey species: Electrofishing catch rates of Bluegill and Gizzard Shad were 16.0/h and 389.0/h, respectively. Total CPUE of Gizzard Shad was higher in 2019 compared to the 2015 survey (389.0/h and 219.0/h, respectively). Index of Vulnerability (IOV) for Gizzard Shad continued to be excellent in 2019, indicating that 99% of Gizzard Shad were available to existing predators (Figure 1). Total CPUE of Bluegill in 2019 was very low (16.0/h) and size structure continued to be dominated by small individuals (Figure 2).

Catfish: The gill net catch rate of Channel Catfish was 2.8/nn in 2015; gill nets were discontinued in 2019 in favor of hoops nets. The 2019 hoop net catch rate was 97.2/net series and over 40% were greater than 12 inches (length range: 8-22 inches; Figure 3). Body condition was poor for most size classes (W_r range: 69-89). No Blue Catfish were observed during the 2019 hoop net survey.

Largemouth Bass: The electrofishing catch rate of Largemouth Bass was low over the last three surveys (CPUE range: 14.0/h – 46.0/h; Figure 4). Size structure has been near the target range (PSD: 40 – 60) during those surveys, ranging from 30-70. However, the small sample size in 2015 and 2019 limited the ability to assess population size structure and extra sampling was not warranted with the amount of effort required to adequately assess the population. Age and growth analysis was not conducted as a result of inadequate sample sizes. The sharp decline in Largemouth Bass densities are likely driven by declining water quality, high sedimentation and limited quality littoral habitat.

Fisheries Management Plan for Big Creek Reservoir, Texas

Prepared – July 2020

ISSUE 1: Recent hoop net survey results indicate a high-density Channel Catfish population in the reservoir with over 40% above the legal length limit. Body condition was moderate to poor for most size classes of fish, indicating a limited prey base. Trailer counts conducted during the summer of 2019 suggest angling effort is low. Increasing angler awareness of the abundant Channel Catfish may help direct harvest-oriented anglers towards the underutilized catfish population.

MANAGEMENT STRATEGY

1. Promote the potential Channel Catfish fishing opportunities on the district Facebook page and other press releases when appropriate.

ISSUE 2: Cumulative siltation is negatively impacting most sportfish populations in the reservoir. Heavy silt deposits continue to reduce quality spawning substrate and limit aquatic macrophyte growth, which further limits recruitment for most sport fish. A large-scale dredging of the upper 1/3 of the reservoir is the only approach capable of restoring quality substrate and habitat necessary to improve recruitment.

MANAGEMENT STRATEGY

1. If funding streams become available for large-scale dredging operations, submit a proposal for Striker Reservoir.

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 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 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.
2. Educate the public about invasive species using media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. 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 (2020–2024)

Sport fish, forage fish and other important fishes

Sport fish in Big Creek Reservoir include Largemouth Bass, Blue and Channel Catfish and crappie. Gizzard and Threadfin Shad, and sunfishes are all present in the reservoir.

Low-density fisheries

Blue Catfish: Blue Catfish have periodically been stocked, but traditional survey methods suggest poor survival. However, a single 25-inch Blue Catfish was collected in the 2016 gill net survey. Other methods may prove more successful in documenting recruitment of stocked Blue Catfish. In the summer of 2023, an exploratory low-frequency electrofishing survey will be conducted to identify any recruitment from previous stockings. Without previous low-frequency data, and poor gill net catch rates suggesting a low-density population, no sample or survey objectives will be set. The results of the exploratory survey will be used to direct future, targeted sampling efforts of Blue Catfish.

Crappie: Crappie have historically been present in the reservoir. Historical trap net data indicated a declining population and trap net surveys were discontinued in 2007. Going forward, crappie will be monitored in conjunction with Channel Catfish hoop net surveys. Without previous hoop net data for crappie and the high probability of gear bias towards larger individuals, no survey or sample objectives will be set. The results of the hoop net survey will be used to determine future sampling efforts of crappie in the reservoir.

Largemouth Bass/Forage: Recent electrofishing results have indicated low density populations of Largemouth Bass and sunfish. With very little anecdotal information on angler utilization of the reservoir there is not a substantial justification to conduct a creel survey. Electrofishing surveys will be limited to no more than 12 stations, during the day, every four years to detect any large-scale changes in the Largemouth Bass population (relative abundance; no target survey precision). This sampling effort will also be sufficient to sample shad and sunfish abundances. Not additional effort will be expended after 12 stations as body condition of predators such as Largemouth Bass and Channel Catfish can provide information on forage abundance relative to predator density.

Survey objectives, fisheries metrics and sampling objectives

Channel Catfish: The 2019 hoop net data suggested Big Creek Reservoir contained a quality Channel Catfish population. Due to the poor survey results with all other sampling methods, hoop net surveys may provide the best approach to obtain some population data. In the summer of 2023, six randomly selected hoop net series will be set to monitor Channel Catfish population trend data (CPUE, PSD, Wr) in order to detect large scale population fluctuations. Based on previous survey results, 6 net series will be sufficient effort to estimate relative abundance with acceptable precision (RSE<25) and size structure of at least 50 stock-sized fish. Otoliths will be removed from 13 Channel Catfish between 11.0 and 12.9 inches to determine average age at legal length.

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Tables and Figures

Table 1. Characteristics of Big Creek Reservoir, Texas.

Characteristic	Description
Year constructed	1987
Controlling authority	City of Cooper
Surface area	520 acres
County	Delta
Reservoir type	Tributary
Shoreline Development Index	3.52
Mean depth	12.0 feet
Secchi visibility (range)	1-2 feet
Conductivity	160 μ S/cm

Table 2. Boat ramp characteristics for Big Creek Reservoir, Texas August, 2019

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Big Creek	33.39628 -95.69553	Y	12	UNK	Good, no access issues

Table 3. Harvest regulations for Big Creek 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, Largemouth	5	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Big Creek Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adult; UNK = unknown.

Species	Year	Number	Size
Gizzard Shad	1988	60	ADL
Threadfin Shad	1991	1,200	ADL
Blue Catfish	1988	26,000	FGL
	1990	5,269	AFGL
	1991	26,135	FGL
	2017	48,391	FGL
	Total	105,795	
Channel Catfish	1989	13,000	FGL
	1991	13,000	FGL
	Total	26,000	
Coppernose Bluegill	1988	150,626	UNK
Florida Largemouth Bass	1988	54,057	FGL
	1988	625	ADL
	1989	10,988	FGL
	1990	38,578	FGL
	1990	2,108	AFGL
	1998	52,894	FGL
	1999	51,960	FGL
	2000	4,500	FGL
	2007	123,860	FGL
	Total	339,570	
White Crappie	1988	26,000	FGL

Table 5. Objective-based sampling plan components for Big Creek Reservoir, Texas, 2019-2020.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Relative Abundance	CPUE–Stock	RSE-Stock \leq 25
	Size structure	PSD, length frequency	
Bluegill ^a	Relative Abundance	CPUE–Total	RSE \leq 25
	Size structure	PSD, length frequency	N \geq 50
Gizzard Shad ^a	Relative Abundance	CPUE–Total	
	Prey availability	IOV	N \geq 50
<i>Hoop netting</i>			
Channel Catfish	Exploratory/gear efficacy		

^a No additional effort will be expended to achieve an RSE \leq 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 aquatic vegetation, Big Creek Reservoir, Texas, 2015–2019. Surface area (acres) is listed with percent of total reservoir surface area in parentheses; tr = trace amounts.

Vegetation	2015	2019
Native emergent		
Water primrose	2 (<1)	2 (<1)
Smartweed	tr	21 (4.0)
Giant bulrush	tr	

Gizzard Shad

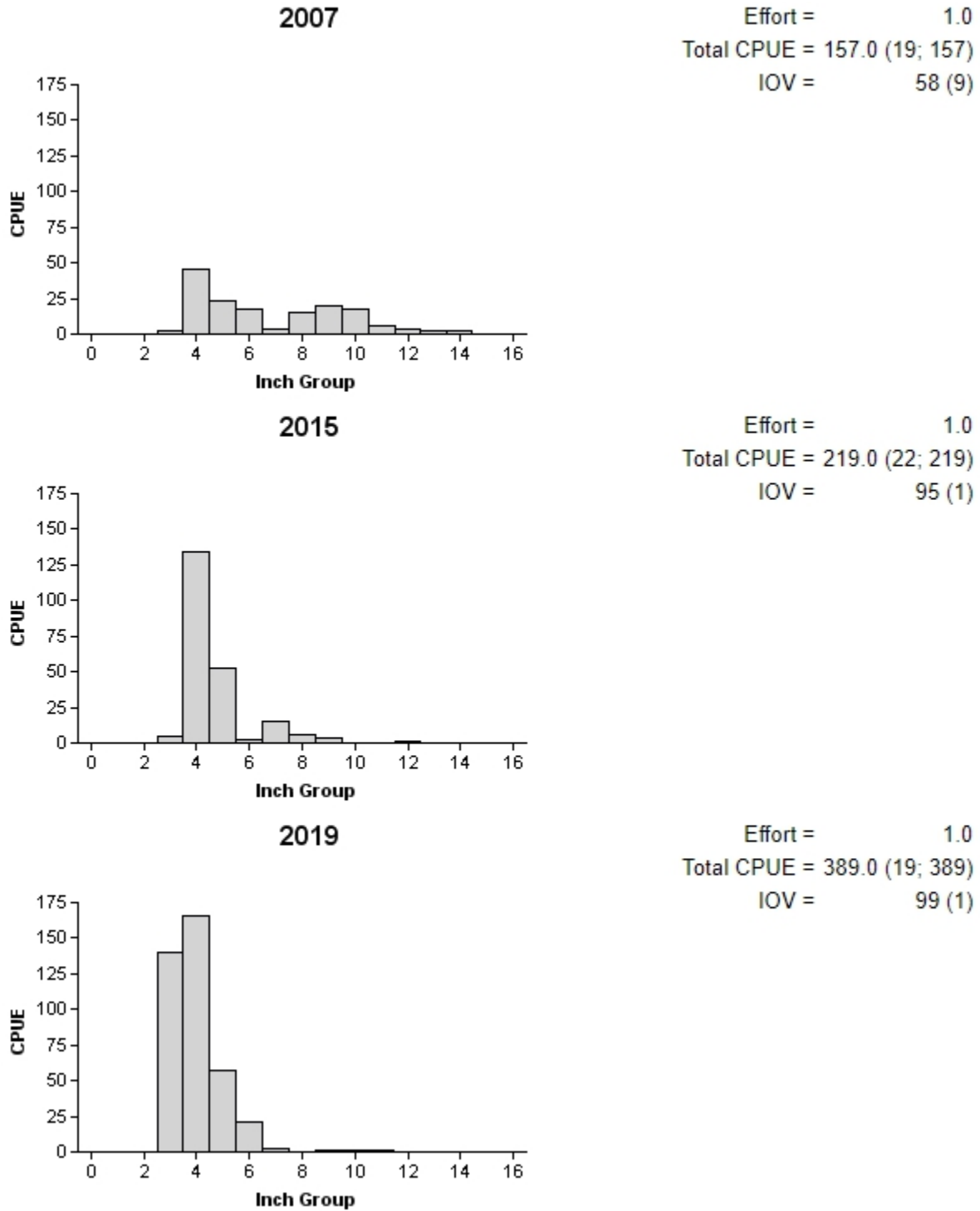


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Big Creek Reservoir, Texas, 2007, 2015, and 2019.

Bluegill

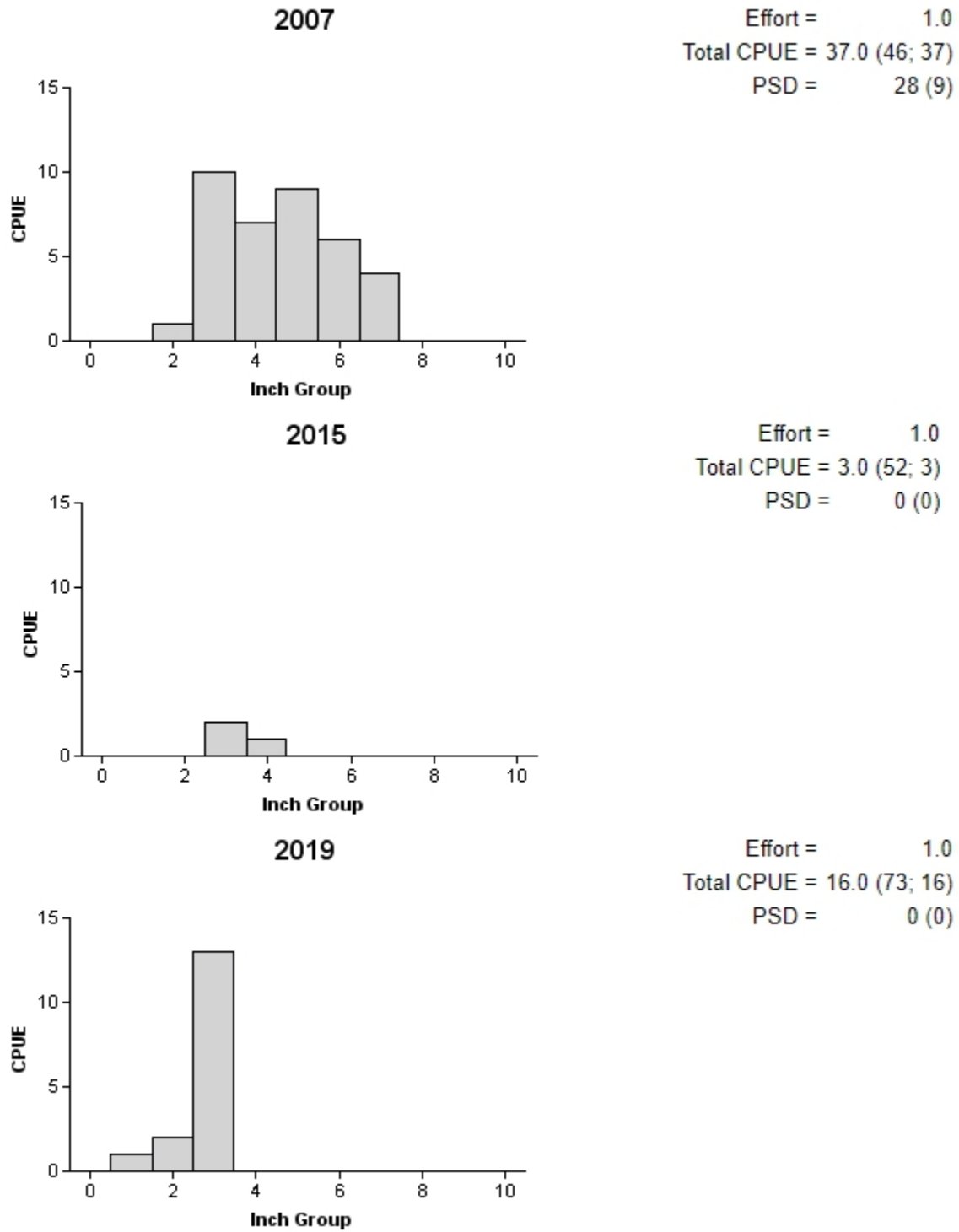


Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Big Creek Reservoir, Texas, 2007, 2015, and 2019.

Channel Catfish

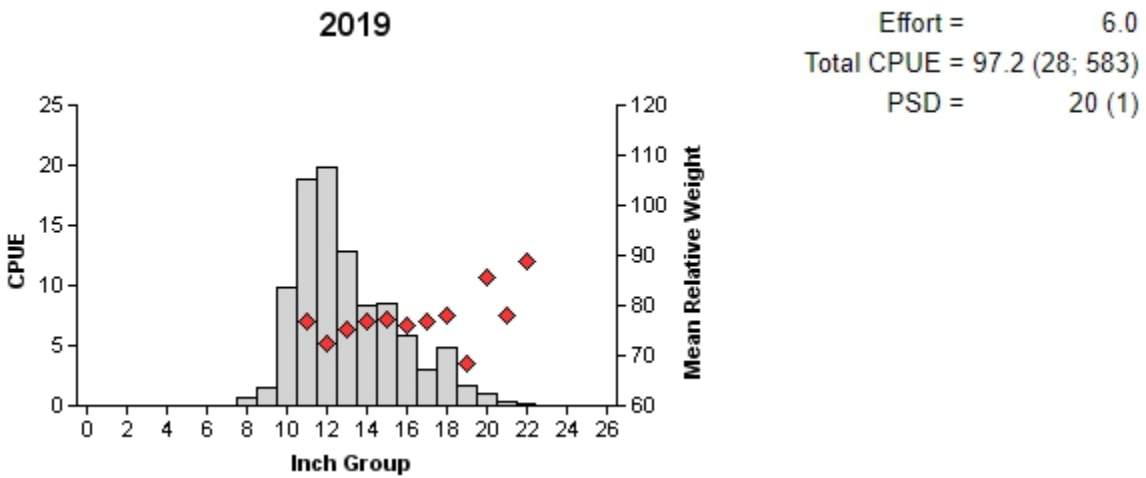


Figure 3. Number of Channel Catfish caught per net night (CPUE), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for hoop net survey, Big Creek Reservoir, Texas, 2019.

Largemouth Bass

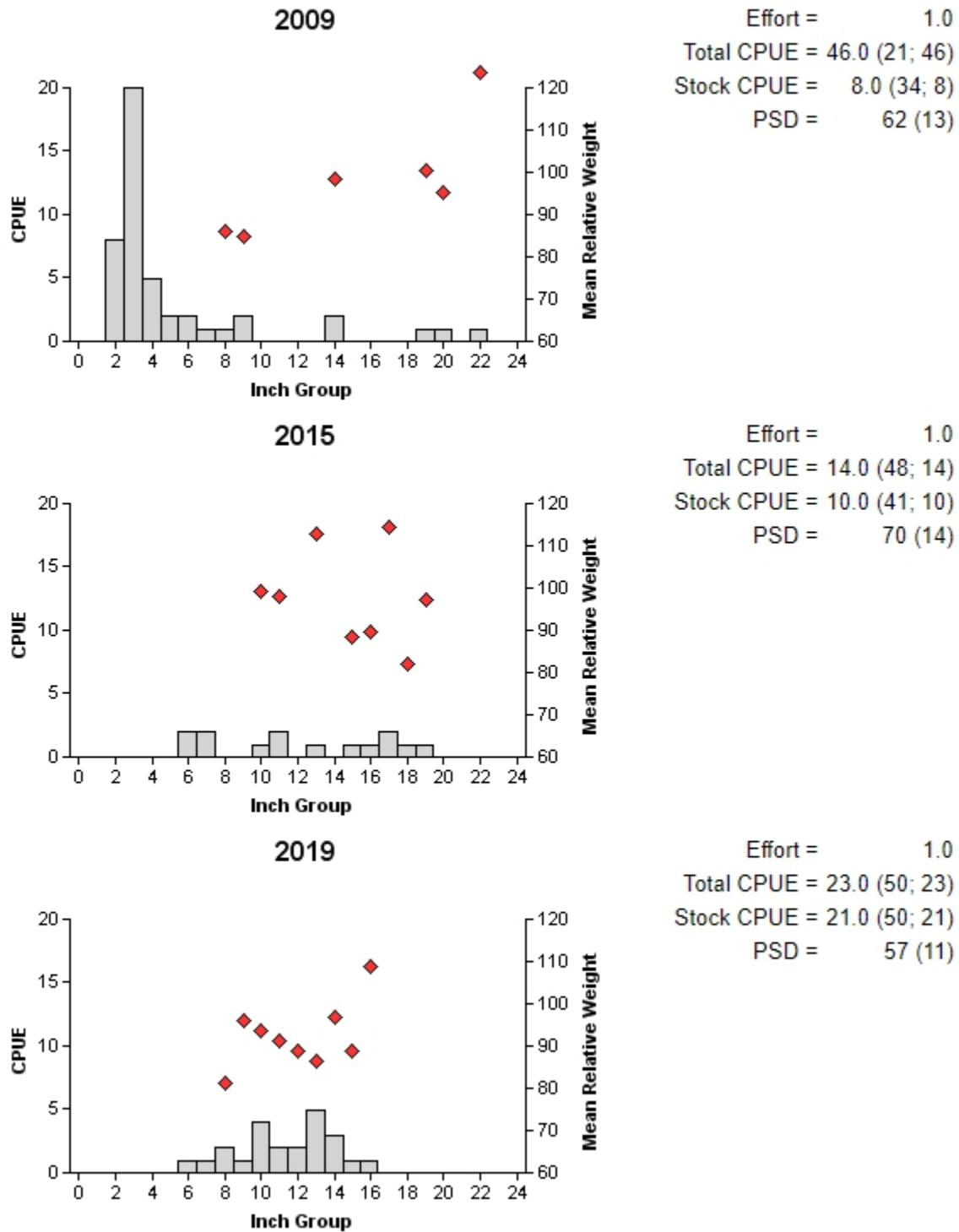


Figure 4. Number of Largemouth Bass caught per hour (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall daytime electrofishing surveys, Big Creek Reservoir, Texas, 2009, 2015, and 2019.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Big Creek Reservoir, Texas. Survey period is June through May. Hoop netting surveys are conducted in the spring, while electrofishing and low-frequency electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

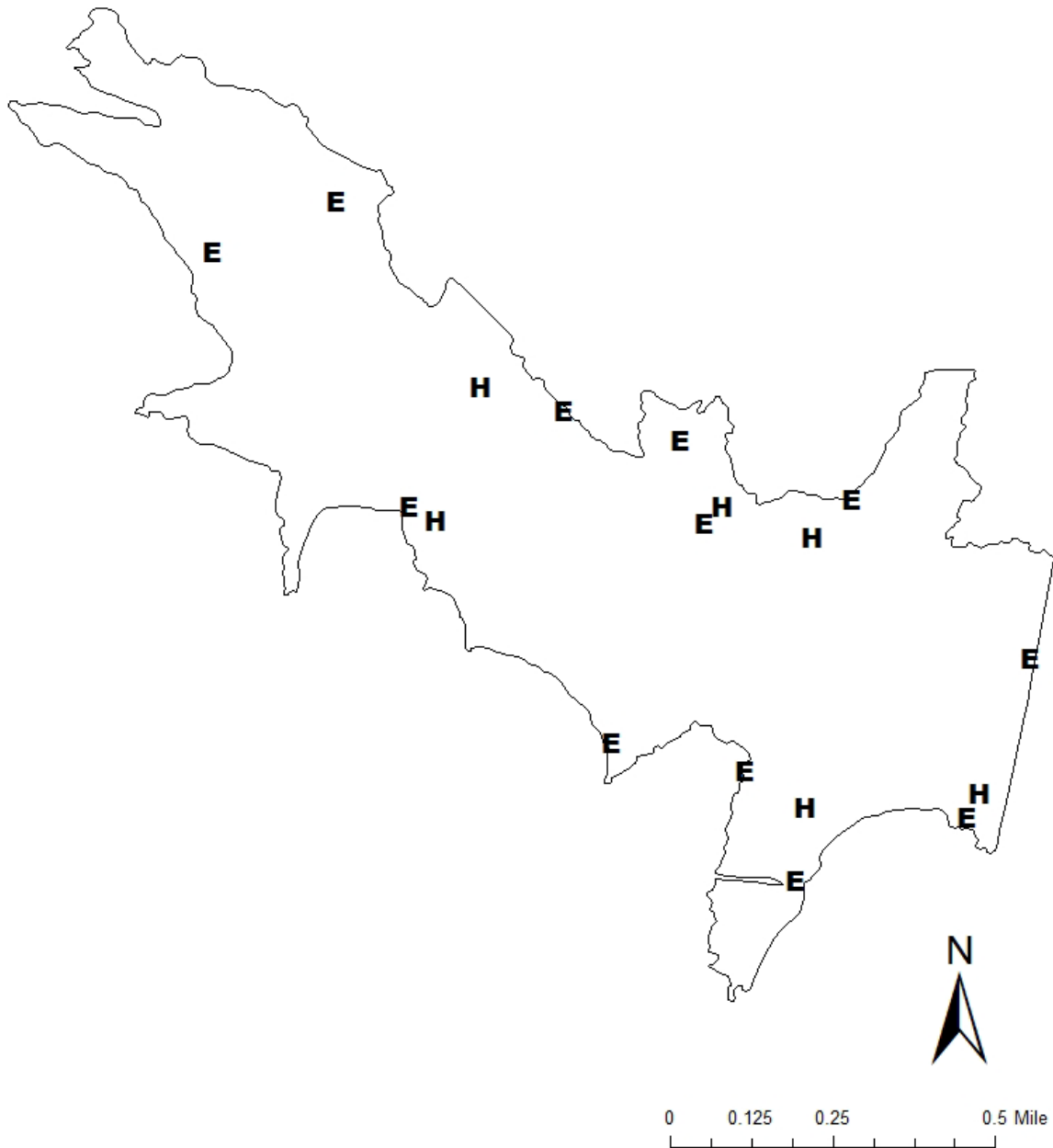
	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Vegetation				S
Day Electrofishing - Fall				S
Low-frequency Electrofishing				A
Hoop Net				S
Report				S

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 Big Creek Reservoir, Texas, 2019. Sampling effort was 6 net series for hoop netting, and 1 hour for electrofishing.

Species	Hoop Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			389	389.0 (19)
Channel Catfish	583	97.2(28)		
Green sunfish			11	11.0 (72)
Warmouth			1	1.0 (100)
Bluegill			16	16.0 (73)
Longear Sunfish			12	12.0 (52)
Largemouth Bass			23	23.0 (50)

APPENDIX B – Map of sampling locations



Location of sampling sites, Big Creek Reservoir, Texas, 2019. Hoop net and electrofishing stations are indicated by H and E, respectively. Water level was near full pool at time of sampling.



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