

# Cedar 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

Prepared by:

Jacob Norman, District Management Supervisor

Inland Fisheries Division  
Tyler District, Tyler, Texas

Carter Smith  
Executive Director

Craig Bonds  
Director, Inland Fisheries

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## Survey and Management Summary

Fish populations in Cedar Creek Reservoir were surveyed in 2019 using electrofishing and trap netting. Planned gill netting in spring 2020 was cancelled due to COVID-19. Anglers were surveyed from June 2019 through February 2020 with a creel survey. The spring quarter angler creel survey (March through June 2020) was cancelled due to COVID-19. Historical data are presented with the 2019-2020 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:** Cedar Creek Reservoir is a 32,623-acre impoundment of Cedar Creek, a tributary of the Trinity River approximately 14 miles northeast of Athens, Texas. The reservoir was constructed by the Tarrant Regional Water District in 1965 to provide water for municipal and industrial use. Boat access is adequate, but public access for bank anglers is limited. Littoral habitat varies with water level, but currently contains flooded terrestrial vegetation.

**Management History:** Important sport fish include Hybrid Striped Bass, White Bass, Largemouth Bass, Blue Catfish, Channel Catfish, and White and Black Crappie. The management plan from the 2015 survey report included continued stocking of Hybrid Striped Bass at 15/acre and annual stocking of Florida Largemouth Bass at 1,000/km of shoreline. Hybrid Striped Bass were stocked in 2016-2018, but fish were not available during 2019. Florida Largemouth Bass were stocked from 2016-2019.

### Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch of Gizzard Shad was moderate, and most were available as prey to sport fish. Bluegill abundance was lower than previous surveys.
- **Catfishes:** Historically, catfish have been a popular fishery on Cedar Creek. Flathead, Blue and Channel Catfish are all present within the reservoir. Blue Catfish continue to be the most abundant and sought-after catfish species.
- **Temperate basses:** White Bass and Hybrid Striped Bass were present in the reservoir. Hybrid Striped Bass numbers fluctuated over the previous gill net surveys, reflective of inconsistent stocking densities.
- **Largemouth Bass:** Largemouth Bass abundance has declined compared to previous surveys. This is likely due to limited aquatic vegetation and poor habitat in areas of sampling locations.
- **Crappie:** Both Black and White Crappie were present in Cedar Creek Reservoir and remained a popular fishery.

**Management Strategies:** Continue stocking Hybrid Striped Bass at 15 fish/acre and Florida Largemouth Bass fingerlings at 1000/km of shoreline. Inform the public about the negative impacts of aquatic invasive species. Continue managing all sport fish under statewide harvest regulations.

## Introduction

This document is a summary of fisheries data collected from Cedar Creek Reservoir in 2019-2020. 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 2019-2020 data for comparison.

## Reservoir Description

Cedar Creek Reservoir is a 32,623-acre impoundment of Cedar Creek, a tributary of the Trinity River approximately 14 miles northeast of Athens, Texas. The reservoir was constructed by the Tarrant Regional Water District (TRWD) in 1965 to provide water for municipal and industrial use. Primary water uses included municipal water supply and recreation. Cedar Creek Reservoir is eutrophic with a mean TSI chl-a of 59.08 (Texas Commission on Environmental Quality 2020). Habitat at time of sampling consisted primarily of flooded terrestrial vegetation and alligatorweed. Abundant boat docks provide additional habitat for fish. Water levels fluctuated from 2010-2014 and averaged 2-8 feet below conservation pool (322 ft msl); elevation has remained at or within 2 feet of pool since January 2015 (Figure 1). Other descriptive characteristics for Cedar Creek Reservoir are in Table 1.

## Angler Access

Cedar Creek Reservoir has two public boat ramps (Chamber Island and County Ramp) and many private ramps. Both public ramps were accessible during the most recent survey period. Shoreline access is limited to the public boat ramp area of County Ramp and the fishing pier located at Chamber Island. Chamber Island is also ADA accessible. Additional boat ramp characteristics are in Table 2.

## Management History

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

1. Stock Hybrid Striped Bass (Palmetto Bass and/or Sunshine Bass) annually at 15 fish/acre to sustain the population and maintain a fishery. Monitor the population with gill net and creel surveys.

**Action:** Hybrid Striped Bass were stocked from 2016-2018 at a rate of approximately 5/acre. Fish were not available for stocking in 2019. Gill netting was conducted in 2016 but canceled in 2020 due to COVID-19. A creel survey was conducted from June 2019 through February 2020; the spring 2020 quarter was canceled due to COVID-19.

2. Stock Florida Largemouth Bass annually at 1000/km of shoreline while quality habitat is still present during the reservoir's new-lake effect. Monitor the population with electrofishing and creel surveys.

**Action:** Florida Largemouth Bass have been stocked annually from 2016-2019. Electrofishing was conducted in the Fall of 2019 and creel survey was conducted as described in previous management action.

**Harvest regulation history:** All sport fishes in Cedar Creek Reservoir are currently managed with statewide harvest regulations (Table 3).

**Stocking history:** Cedar Creek Reservoir has been stocked annually (with the exception of 2010, 2012, and 2019) with Hybrid Striped Bass since 2002. Florida Largemouth Bass have been stocked annually since 2015. The complete stocking history is in Table 4.

**Water transfer:** Cedar Creek Reservoir was built by TRWD for municipal water supply. TRWD is currently a water wholesaler to more than ten counties in the Dallas and Fort Worth (DFW) Metroplex.

Raw water is transferred from Cedar Creek through the East Texas Pipeline and converges with water from Richland Chambers near Waxahachie, Texas. Water from the pipeline is available along a grid system to multiple water treatment plants in the DFW area and has the potential to be introduced directly or indirectly into Richland Chambers Reservoir, Lake Halbert, Lake Bardwell, Lake Benbrook, Joe Pool Reservoir, Mountain Creek Reservoir, Lake Arlington, Eagle Mountain Reservoir and Lake Worth. The TRWD and the City of Dallas Water Utilities have partnered to construct an Integrated Pipeline Project, which will create further connections between municipalities and reservoirs, including Lake Palestine.

## Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Cedar Creek Reservoir (Norman and Ott 2016). 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 2017).

**Electrofishing** – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.93 hours at 23, 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. Insufficient Largemouth Bass were collected to meet the length-at-age survey objective.

**Trap netting** – Crappie were collected using trap nets (10 net nights at 10 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Ages for White Crappie were determined using otoliths from 13 randomly selected fish (range 9.0 to 10.9 inches); insufficient Black Crappie were collected for length-at-age analysis.

**Gill netting** – Additional gill netting scheduled for spring 2018 was cancelled when review of management objectives determined large-scale changes in target fish populations could be monitored by gill netting every four years. The spring 2020 gill netting survey was cancelled due to COVID-19.

**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). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). 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 ( $RSE = 100 \times SE \text{ of the estimate/estimate}$ ) was calculated for all CPUE and creel statistics.

**Creel survey** – An access-point creel survey was conducted from June 2019 through February 2020. The scheduled spring quarter survey from March through May 2020 was cancelled due to COVID-19. 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 2017).

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

**Water level** – Source for water level data was the United States Geological Survey (USGS 2020).

## Results and Discussion

**Habitat:** Ott and Beck (2008) reported 60% of the structural habitat was bulkhead with boat docks; there has been minimal variation in habitat in recent years. During 2019 vegetation occupied less than 1% of the total surface acreage of Cedar Creek Reservoir (Table 6). Natural shoreline loss to bulkhead and subsequent increased wave action likely limit aquatic plant growth.

**Creel:** The COVID-19 pandemic caused the cancellation of the scheduled spring (March-May) 2020 angler survey. Therefore, data from the 2019/2020 survey are not directly comparable to previous years. Directed fishing effort by anglers was highest for crappie (45%), followed by anglers seeking Largemouth Bass (23%) and catfishes (21%) (Table 7). Total fishing effort for all species during the 9-month survey period was 69,183 hours and directed expenditures were \$275,295 (Table 8).

**Prey species:** Threadfin Shad and Gizzard Shad were the most abundant prey species in the 2019 electrofishing survey. Gizzard Shad electrofishing CPUE increased from 188.9/h in 2015 to 299.5/h in 2019 (Figure 2). Gizzard Shad IOV was high, indicating 92% of fish were available as prey to predators

(Figure 2). Bluegill were present but electrofishing CPUE declined to 48.1/h, likely due to limited aquatic plant coverage in the reservoir (Figure 3).

**Catfish:** Gill netting scheduled for spring 2020 was cancelled due to the COVID-19 pandemic. Blue Catfish and Channel Catfish data from Norman and Ott (2016) are included in this report for reference (Figures 4 and 5).

Directed angling effort toward catfishes was 14,764 h from June 2019 through February 2020 (Table 9). Anglers caught an estimated 0.53 fish/h and harvested 2,720 Blue Catfish and 679 Channel Catfish (Table 9). No legal-sized fish were released after being caught. Harvested Blue Catfish ranged in size from 12-20 inches (Figure 6) and harvested Channel Catfish ranged in size from 12-18 inches (Figure 7).

**Temperate bass:** Gill netting scheduled for spring 2020 was cancelled due to the COVID-19 pandemic. White Bass and Hybrid Striped Bass data from Norman and Ott (2016) are included in this report for reference (Figures 8 and 9).

The June 2019 through February 2020 angler creel survey estimated anglers fished 4,512 h for temperate bass. Anglers caught 1.1 fish/h and harvested 3,210 White Bass (Table 10). No Hybrid Striped Bass were observed during the creel survey period. Harvested White Bass ranged from 10-12 inches (Figure 10).

**Largemouth Bass:** The Largemouth Bass electrofishing catch rate of stock-size ( $\geq 8$  inches) fish was lower in 2019 (14.0/h) than in 2015 (27.1/h) and 2007 (21.5/h) (Figure 11). Reduced amounts of aquatic vegetation in the reservoir likely limits Largemouth Bass recruitment and overall abundance. Size structure did improve to a more desired level (PSD = 40-70; Willis et al. 1993) in 2019 (PSD = 59; Figure 12). Body condition in 2019 was good; relative weights averaged 90 - 110 for all size classes of fish and was similar to body condition of previous surveys.

Directed fishing effort and catch per hour for Largemouth Bass was 15,959 h and 0.8 fish/h, respectively during the latest angler creel survey (Table 11). The survey did not document any harvest of Largemouth Bass by anglers but did estimate that 2,536 fish were held in livewells by tournament anglers for weigh-in and live release. Fish retained by tournament anglers for weigh-in and live release ranged from 14 to 18 inches (Figure 12).

**Crappie:** The 2019 trap netting survey indicated both White and Black Crappie were still present within the reservoir (Figures 13 and 14). White Crappie size structure in 2019 (PSD = 74) increased from 2015 (PSD = 40; Figure 13). Condition of White Crappie was excellent with mean  $Wr$  values  $>100$  for most inch groups. White Crappie Growth was fast; average age at 10 inches (9.0 to 10.9 inches) was 1.1 years ( $N=13$ ; range = 1-2 years). Black Crappie trap net CPUE of stock-length fish has been consistent over the past three surveys (Figure 14). Fish body condition was good with mean  $Wr$  values  $>90$  for most inch groups. Size structure was good in 2019 (PSD = 78) and consistent with previous surveys.

Directed fishing effort for crappie (30,950 h) was higher during the latest survey compared to previous years (Table 12), even though the 2019/2020 was only 9 months instead of a full annual survey due to COVID-19 related cancellation. Anglers caught an estimated 1.0 fish/h. Total harvest was 31,920 crappie during the 2019/2020 survey and was distributed fairly evenly between White Crappie and Black Crappie. The crappie fishery is highly consumptive; no legal-size crappie were released during the survey period. Harvested White Crappie ranged from 10-15 inches (Figure 15) and Black Crappie ranged from 10-14 inches (Figure 16).

# Fisheries Management Plan for Cedar Creek Reservoir, Texas

Prepared – July 2020

**ISSUE 1:** Hybrid Striped Bass are an important fishery at Cedar Creek Reservoir; inconsistency in annual stocking frequency and densities have resulted in poor angler catch rates and a fishery with unrealized potential. Annual stockings (Palmetto Bass and/or Sunshine Bass) are required to sustain the population and maintain a fishery.

## MANAGEMENT STRATEGIES

1. Stock Hybrid Striped Bass (Palmetto Bass, Sunshine Bass, or combination of both to meet stocking request) annually at 15 fish/acre. If annual stocking requests are met consistently for two consecutive years, drop the request to 10 fish/acre. Fry can be substituted at the appropriate rate if fingerlings are not produced or available.
2. Monitor Hybrid Striped Bass presence and size distribution through gill net surveys in 2024, and monitor catch, harvest, and fishing effort through a creel survey in 2023/2024.

**ISSUE 2:** The lack of aquatic vegetation in Cedar Creek Reservoir is largely due to water fluctuations and wind/wave action. This lack of fisheries habitat is a limiting factor for cover-seeking species like Largemouth Bass and Bluegill. Because conditions are not favorable for aquatic plant growth, artificial fisheries habitat could improve these fisheries.

## MANAGEMENT STRATEGY

1. Seek opportunities to partner with stakeholder groups to install artificial fisheries habitat throughout select areas of the 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. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.



## Objective-Based Sampling Plan and Schedule (2020–2024)

Sport fishes in Cedar Creek Reservoir include Blue and Channel Catfish, White and Hybrid Striped Bass, Largemouth Bass, and Black and White Crappie. Important prey species include Gizzard and Threadfin Shad, and sunfishes. The following objective-based sampling plan is intended to meet the sampling schedule listed in Table 13.

### Survey objectives, fisheries metrics, and sampling objectives

**Crappie:** Crappie represented 45% of the directed angler effort during the most recent creel survey at Cedar Creek Reservoir. Trap netting CPUE has been moderate in recent surveys. Based on bootstrap analysis of historical data, it would take a minimum of 20 trap nets to accurately estimate size structure (PSD:  $N > 50$  stock-length fish) at least 80% of the time. The historically variable catch rates suggest it would take a minimum of 35 trap nets to estimate relative abundance of stock size fish with acceptable precision ( $RSE-S < 25$ ). Crappie size structure, body condition, and growth (PSD,  $Wr$ , mean age at 10 inches) will continue to be monitored every four years in order to detect any larger scale population fluctuations. In the fall of 2023 a minimum of 10, randomly selected single-cod shoreline trap net sites will be sampled, and up to 10 additional nets will be set, if needed, to collect at least 50 stock-size crappies (species combined). We believe that the level of sampling proposed will provide our secondary sampling objective of 13 specimens between 9.0 and 10.9 inches for age and growth.

**Blue Catfish:** Catfishes accounted for 21% of directed angler effort during the last creel survey (June 2019-February 2020). Bootstrap analysis of historical gill net data suggests population indices (CPUE, PSD,  $Wr$ ) can be estimated with acceptable precision ( $RSE < 25$ ) and sample size ( $N \geq 50$  stock-size fish) with only 10 net-nights of gill net effort at least 80% of the time. Population trend data (CPUE and PSD) will be monitored every four years in order to detect any large-scale fluctuations. In the spring of 2024, 10 gill nets will be set, with up to 10 additional nets set, in order to achieve a precise estimate ( $RSE < 25$ ) of abundance and an acceptable size-structure estimate ( $N \geq 50$  stock-size fish).

**Channel Catfish:** Channel Catfish gill net catch rate from the last three surveys has ranged from 2.5 - 10.3 fish/nn, however precision around the estimate has varied. Based on bootstrap analysis of historical data it would take a minimum of 63 gill nets to estimate relative abundance with acceptable precision ( $RSE < 25$ ) and 33 gill nets to estimate size structure from an appropriate sample size ( $N=50$ ). In accordance with Blue Catfish sampling, 10 gill nets will be set in Spring 2024, with up to 10 additional nets, in attempts to estimate Channel Catfish relative abundance and size structure. No additional effort will be conducted if survey objectives are not met after 20 total net nights. However, lower precision ( $RSE < 35$ ) of CPUE estimates will be acceptable, if necessary, to make historical comparisons and determine further sampling needs (e.g. age at legal-length analysis).

**Hybrid Striped Bass:** Hybrid Striped Bass represented 7% (total temperate bass) of the directed angler effort during the most recent creel survey at Cedar Creek Reservoir. The last three gill net catch rates have been low and varied from 0.1 – 1.3 fish/nn; likely the result of inconsistent stocking rates. Bootstrap analysis of historical data (2012, 2014) suggest a large amount of effort ( $\geq 95$  randomly selected gill net nights) would be required to obtain precise CPUE estimates (i.e.  $RSE < 25$ ) and adequate stock-size fish ( $N \geq 50$ ) to estimate size structure. While trend data will be extremely difficult to estimate, it will still be necessary to document the survival of stocked hybrids within the reservoir and the overall body condition. In accordance with the catfish sampling objectives, 10 gill nets will be set in the spring of 2024 with up to 10 more nets, if necessary, in order to document the presence of Hybrid Striped Bass year classes. Average  $Wr$ ; and catch data will still be reported. No additional effort will be expended if Hybrid Striped Bass have not been collected after 20 gill nets.

**White Bass:** The last three White Bass gill net catch rates have been low and varied from 0.7 – 1.4 fish/nn; likely a result of drought and reduced inflow from tributaries during the spawning season. Bootstrap analysis of historical data suggests an impractical amount of effort ( $\geq 48$  randomly selected gill net nights) would be required to obtain precise CPUE estimates (i.e.  $RSE < 25$ ) and adequate stock-size fish ( $N \geq 50$ ) to estimate size structure. In accordance with the catfish sampling objectives, 10 gill nets

will be set in the spring of 2024, with up to 10 more, if necessary, in order to document the presence of White Bass. Relative weight ( $Wr$ ) and catch data will still be reported. No additional effort will be expended if White Bass have not been collected after 20 gill nets.

**Largemouth Bass:** Largemouth Bass accounted for 23% of total directed angler effort during the last creel survey. Electrofishing surveys conducted every four years from 2007-2019 produced CPUEs ranging from 20.2 to 81.9 fish/h. Bootstrap analysis of historical data suggests estimating reliable population metrics (CPUE;  $RSE < 25$ , PSD;  $N > 50$  stock size individuals) would require at least 37 randomly selected 5-minute electrofishing stations, or 22 stations to just estimate relative abundance. Nighttime electrofishing at random stations have been largely ineffective in achieving adequate population samples for Largemouth Bass. Therefore, during fall 2023, electrofishing will be conducted with stratified random stations. Only portions of the reservoir with quality habitat will be included in the stratum. Population trend data (CPUE, PSD,  $Wr$ ), along with age and growth samples, will be monitored in order to detect any large-scale population fluctuations. Up to 24 randomly selected 5-minute electrofishing stations will be conducted to estimate both relative abundance with an  $RSE < 25$  and size structure of at least 50 stock-size fish. Up to 12 additional biologist-selected stations will be conducted if necessary, to collect the minimum 50 stock-length fish. The average age of Largemouth Bass between 330 and 381 mm (Category 2;  $N = 13$ ) will be estimated in 2023, and every four years thereafter.

**Gizzard Shad and Bluegill:** Relative abundance and IOV have been estimated for Gizzard Shad every four years since 1997 and have remained relatively stable. Gizzard Shad CPUE and IOV will continue to be monitored every four years with up to 24 randomly selected 5-minute electrofishing stations as per objective-based sampling plans for Largemouth Bass. Bluegill and other sunfish species are another prey source for predator species in Cedar Creek; catch rates have been historically variable and appear to be directly related to reservoir elevation. Sunfish relative abundance and size structure will be estimated every four years with up to 24 randomly selected 5-minute electrofishing stations as per objective-based sampling plans for Largemouth Bass. However, no additional stations will be conducted for sunfish species if target precision ( $RSE < 25$  for CPUE) and at least 50 stock-size individuals are not collected after two hours of effort. The Largemouth Bass population estimates will determine if all 24 stations are necessary. If Largemouth Bass catch rate and size structure targets are met with fewer stations, the survey will be complete, and  $Wr$ 's from Largemouth Bass will be used as a secondary indicator to prey availability.

**Angler Data:** Historically, the Cedar Creek fishery has been monitored through angler creel surveys in order to monitor angling trends (species targeted, effort, catch and directed expenditures). Angler trend data will continue to be monitored with year-long (4 quarter) creel from June 2023 through May 2024. Each quarter of the creel will consist of 5 randomly selected weekend creel days and 4 randomly selected weekday creel days.

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## Tables and Figures

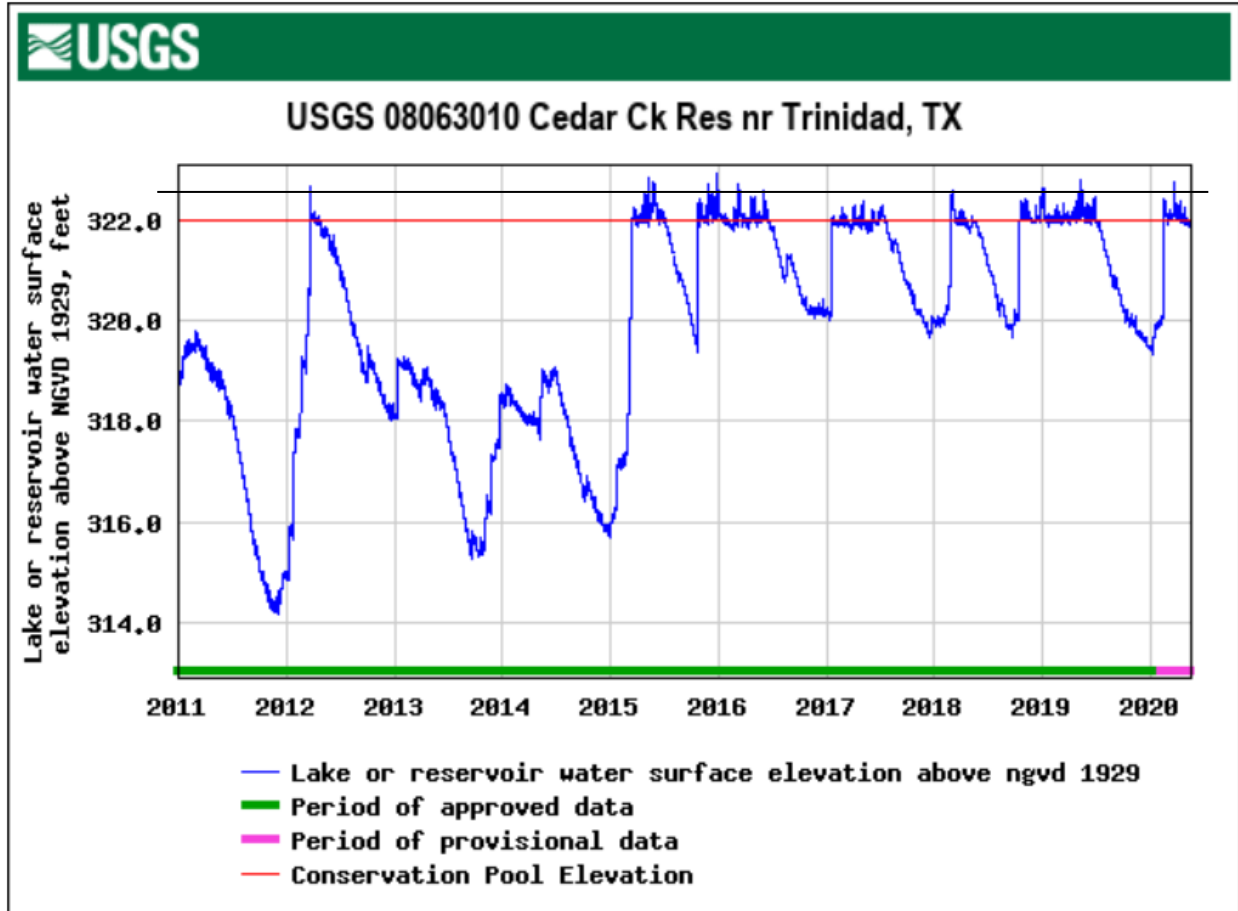


Figure 1. Water level elevations in feet above mean sea level (MSL) recorded for Cedar Creek Reservoir, Texas.

Table 1. Characteristics of Cedar Creek Reservoir, Texas.

Characteristic	Description
Year constructed	1965
Controlling authority	Tarrant Regional Water District
Counties	Henderson (dam), Kaufman
Reservoir type	Tributary
Shoreline Development Index (SDI)	1.9
Conductivity	280 $\mu\text{S}/\text{cm}$

Table 2. Boat ramp characteristics for Cedar Creek Reservoir, Texas, August 2019. Reservoir elevation at time of survey was 322 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft.)	Condition
Chamber Island	32.32930 -96.17042	Y	75	317	Good
Sandy Shores Marina	32.32866 -96.15995	N	70	315	Good
Lone Star Marina	32.26172 -96.15341	N	50	317	Good
Log Cabin	32.21733 -96.01523	N	100	317	Good
County Ramp	32.20874 -96.02556	Y	40	319	Good
Fisherman's Wharf	32.18871 -96.03118	N	40	318	Good

Table 3. Harvest regulations for Cedar 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, White	25	10-inch minimum
Bass, Hybrid Striped	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 Cedar Creek Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; UNK = unknown.

Species	Year	Number	Life Stage
Channel Catfish	1966	7,600	AFGL
	1973	125	UNK
	Total	7,725	
Florida Largemouth Bass	1976	343,000	FRY
	1977	20,000	FRY
	1978	194,847	FGL
	1978	203,990	FRY
	1997	343,012	FGL
	1998	453,072	FGL
	1999	342,424	FGL
	2000	57,986	FGL
	2004	501,870	FGL
	2005	496,806	FGL
	2008	185,016	FGL
	2009	531,063	FGL
	2015	29,700	FGL
	2016	399,930	FGL
	2017	149,309	FGL
	2018	435,455	FGL
2019	435,765	FGL	
Total	5,123,245		
Largemouth Bass	1966	690,000	FRY
Palmetto Bass (Striped X White Bass hybrid)	1977	169,900	UNK
	1979	172,425	UNK
	1983	143,332	UNK
	1984	452,940	FGL
	1991	175,232	FGL
	1991	1,033,577	FRY
	1992	521,494	FGL
	1993	114,757	FGL
	1993	889,000	FRY
	1994	518,259	FGL
	1995	531,200	FGL
	1996	516,724	FGL
	1997	290,540	FGL
1998	514,907	FGL	
1999	265,310	FGL	

Table 4. Stocking history continued.

Species	Year	Number	Life Stage
Palmetto Bass (Striped X White Bass hybrid)	2002	258,467	FGL
	2003	244,723	FGL
	2004	326,988	FGL
	2005	215,660	FGL
	2006	132,664	FGL
	2007	170,396	FGL
	2007	1,054,822	FRY
	2008	308,108	FGL
	2009	124,836	FGL
	2011	101,341	FGL
	2013	269,031	FGL
	2014	166,620	FGL
	2015	224,957	FGL
	2017	141,712	FGL
	2018	110,326	FGL
	Total		10,160,248
Sunshine Bass (White X Striped Bass hybrid)	2014	197,733	
	2016	160,706	
	Total		358,439
Threadfin Shad	1984	7,015	AFGL
Walleye	1975	1,650,000	FRY
	1976	1,852,000	FRY
	1977	2,100,000	FRY
	Total		5,602,000

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

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock $\leq$ 25
	Size structure	PSD, length frequency	N $\geq$ 50 stock
	Age-and-growth	Age at 14 inches	N = 13, 13.0 – 14.9 inches
	Condition	<i>Wr</i>	10 fish/inch group (max)
	Genetics	% FLMB	N = 30, any age
Bluegill <sup>a</sup>	Abundance	CPUE – stock	
	Size structure	PSD, length frequency	N $\geq$ 50
Gizzard Shad <sup>a</sup>	Abundance	CPUE – Total	
	Prey availability	IOV	N $\geq$ 50
<i>Trap netting</i>			
Crappie	Size structure	PSD, length frequency	N = 50
	Condition	<i>Wr</i>	10 fish/inch group (max)
	Age-and-growth	Age at 10 inches	N = 13, 9.0 – 10.9 inches
<i>Gill Netting</i>			
Blue Catfish	Abundance	CPUE – stock	RSE-Stock $\leq$ 25
	Size structure	PSD, length frequency	N = 50
	Condition	<i>Wr</i>	10 fish/inch group (max)
Channel Catfish <sup>b</sup>	Size structure	PSD, length frequency	
	Condition	<i>Wr</i>	
White Bass <sup>b</sup>	Condition	<i>Wr</i>	
	Age-and-growth	Age at 10 inches	
Hybrid Striped Bass <sup>b</sup>	Presence/Absence		
	Condition	<i>Wr</i>	
	Age-and-growth	Age at 18 inches	

<sup>a</sup> 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.

<sup>b</sup> No additional effort will be expended to meet and evaluate survey objectives if not reached by necessary effort to evaluate Blue Catfish.



Table 6. Survey of aquatic vegetation, Cedar Creek Reservoir, Texas, 2007–2019. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2007	2015	2019
Native emergent			
Bulrush		5 (<1)	3 (<1)
Cutgrass		8 (<1)	11 (<1)
Water willow			3 (<1)
Non-native			
Alligatorweed (Tier III)*	448 (1.4)	47 (<1)	9 (<1)
Water hyacinth (Tier III)*	197 (<1)	< 1 (<1)	0

\*Tier III is Watch Status

Table 7. Percent directed angler effort by species for Cedar Creek Reservoir, Texas, 2007–2020. Survey periods were from June through May for 2007/2008 and 2015/2016, and June through February for 2019/2020.

Species	2007/2008	2015/2016	2019/2020
Catfishes	41.0	27.1	21.3
Temperate bass	9.0	8.1	6.5
Sunfishes	0	0.3	0
Largemouth Bass	19.0	41.3	23.1
Crappies	8.0	21.0	44.7
Anything	23.0	2.1	4.3

Table 8. Total fishing effort (h) for all species and total directed expenditures at Cedar Creek Reservoir, Texas, 2007-2020. Survey periods were from June through May for 2007/2008 and 2015/2016, and June through February for 2019/2020. Relative standard error is in parentheses.

Creel statistic	2007/2008	2015/2016	2019/2020
Total fishing effort	272,047 (17)	109,102 (27)	69,183 (40)
Total directed expenditures	\$1,630,227	\$1,053,162	\$275,295

## Gizzard Shad

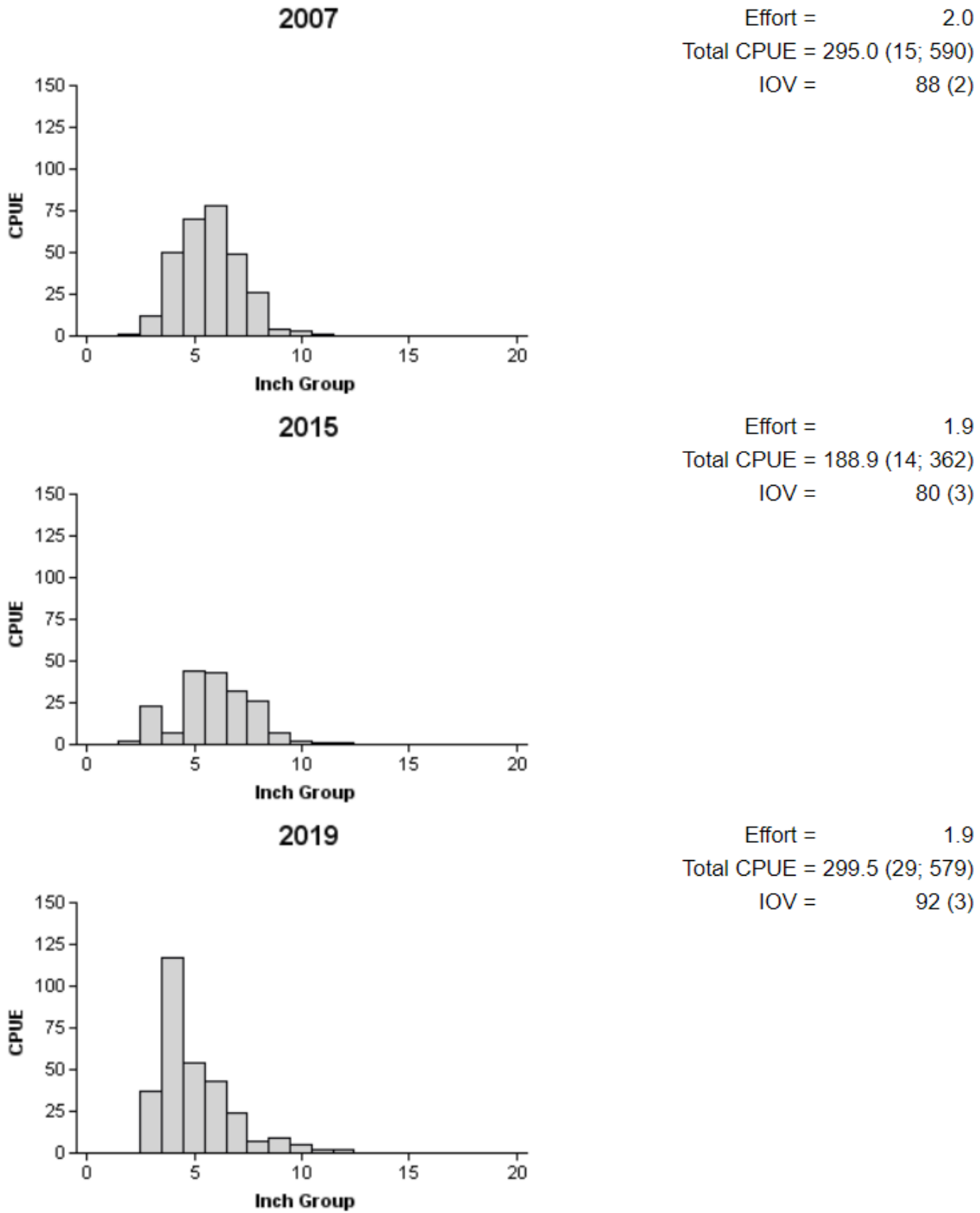


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Cedar Creek Reservoir, Texas, 2007, 2015, and 2019.

## Bluegill

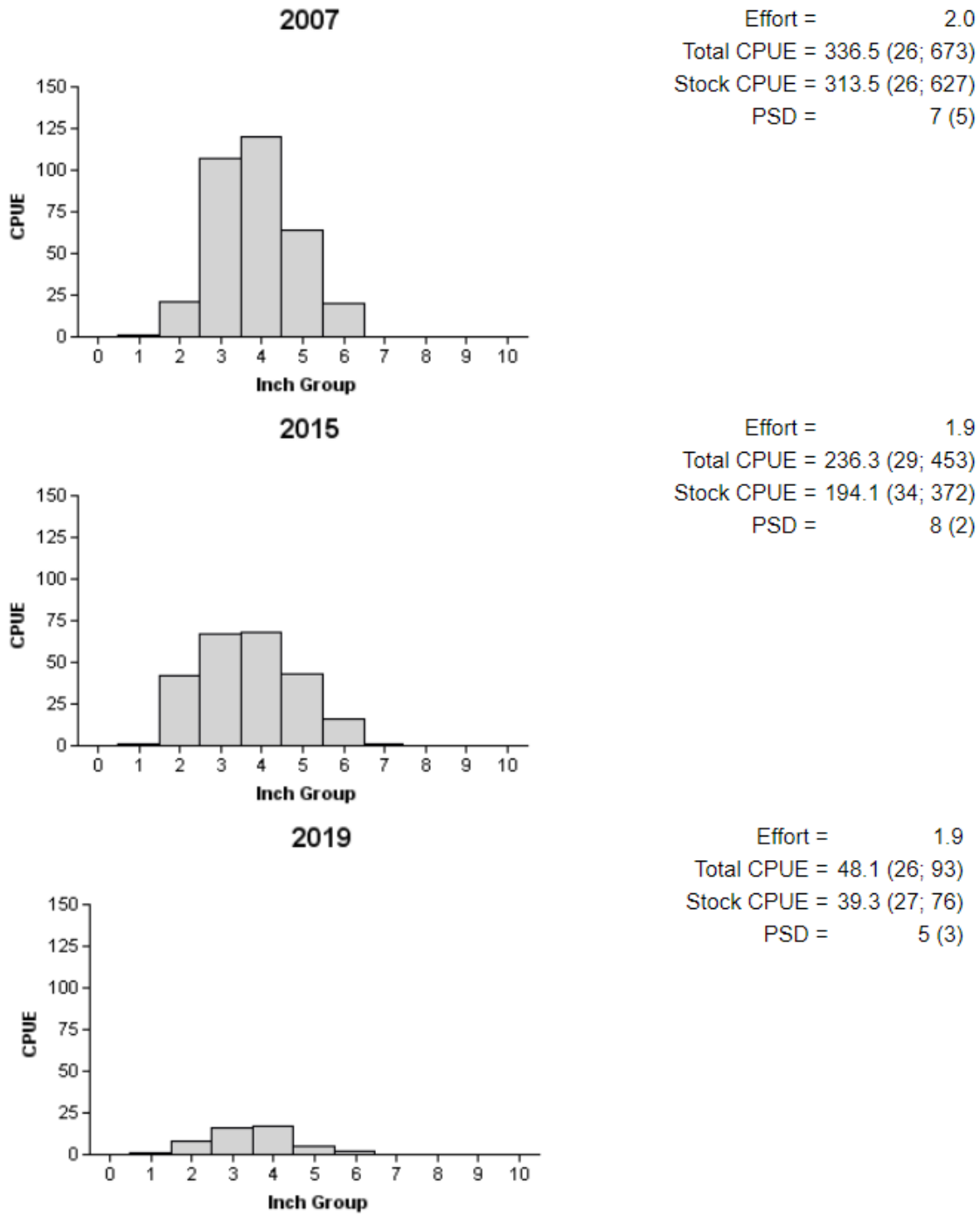


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cedar Creek Reservoir, Texas, 2007, 2015, and 2019.

### Blue Catfish

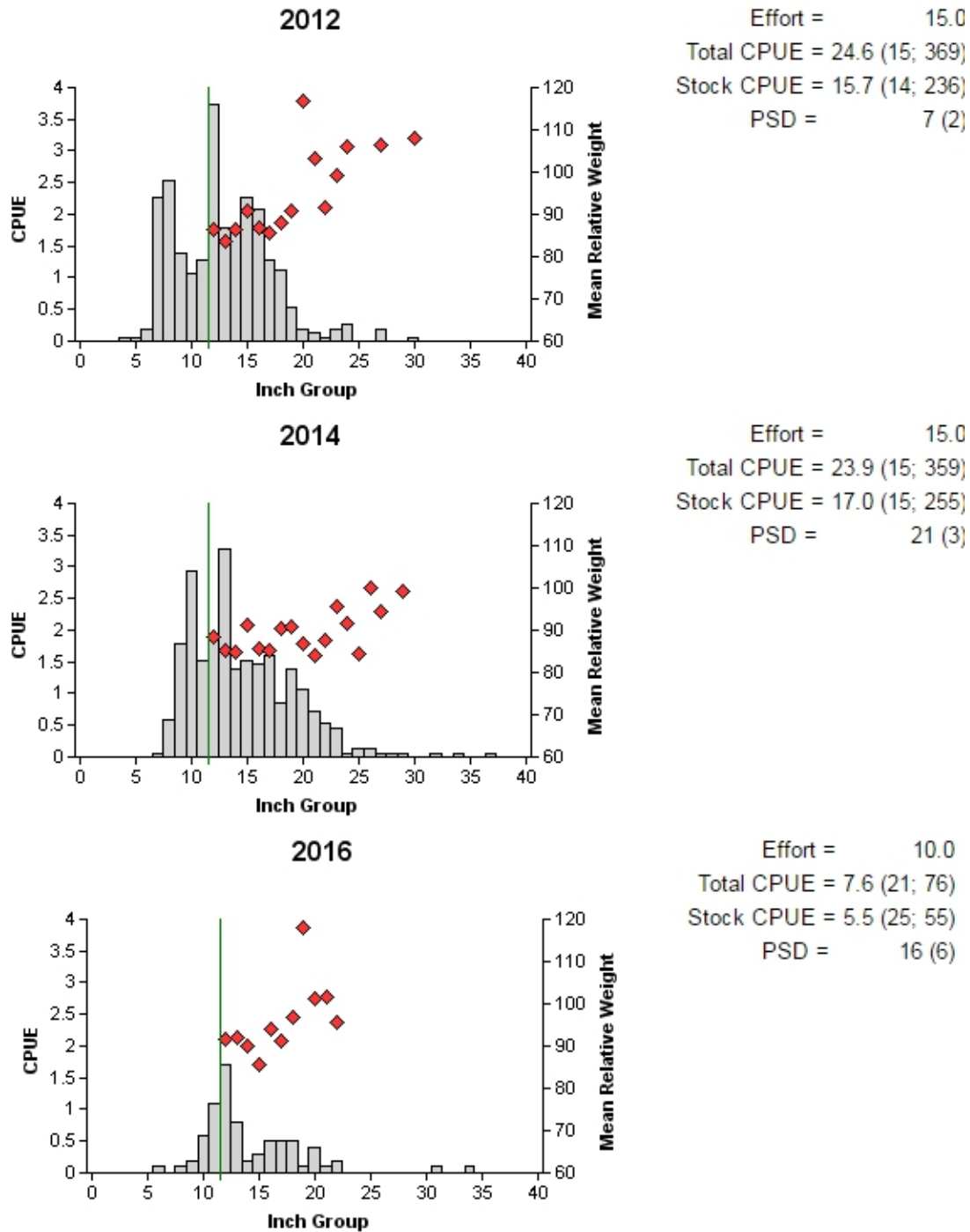


Figure 4. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cedar Creek Reservoir, Texas, 2012, 2014, and 2016. Vertical line indicates minimum length limit.

## Channel Catfish

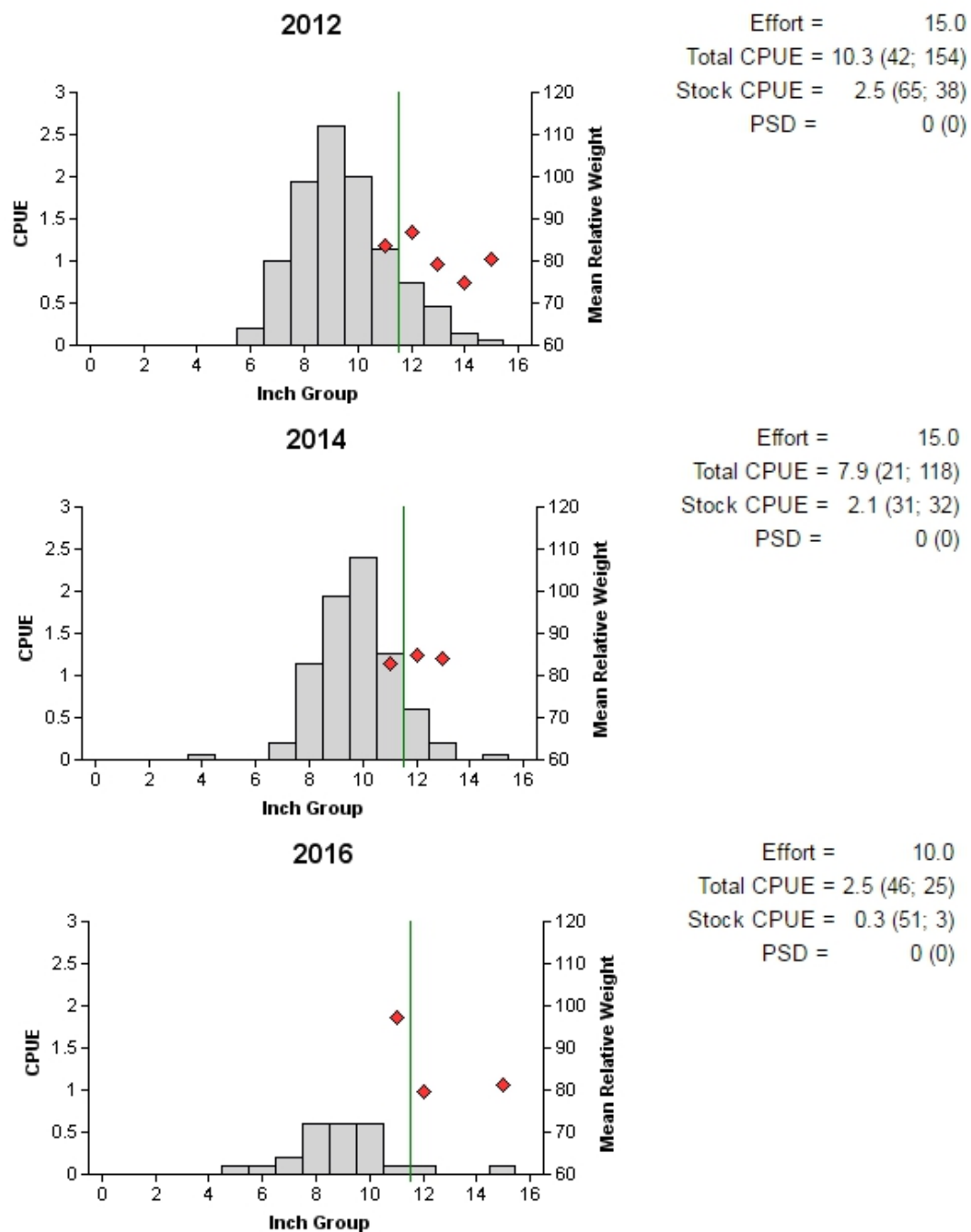


Figure 5. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cedar Creek Reservoir, Texas, 2012, 2014, and 2016. Vertical line indicates minimum length limit.

Table 9. Creel survey statistics for catfish at Cedar Creek Reservoir, Texas, from June 2007 through May 2008, June 2015 through May 2016, and June 2019 through February 2020. Total catch per hour is for anglers targeting all catfish and total harvest is the estimated number of harvested catfish by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2007/2008	2015/2016	2019/2020
Surface area (acres)	31,813	32,132	32,623
Directed effort (h)	127,776 (137)	29,550 (32)	14,764 (61)
Directed effort/acre	4.02 (137)	0.92 (32)	0.45 (61)
Total catch per hour	1.8 (52)	0.98 (32)	0.53 (75)
Total harvest	93,073 (31)	37,335 (49)	3,399 (137)
Blue Catfish	58,547 (30)	34,890 (44)	2,720 (100)
Channel Catfish	34,526 (34)	2,445 (113)	679 (290)
Harvest/acre	2.7 (31)	1.2 (49)	0.1 (143)
Percent legal released	12	7	0

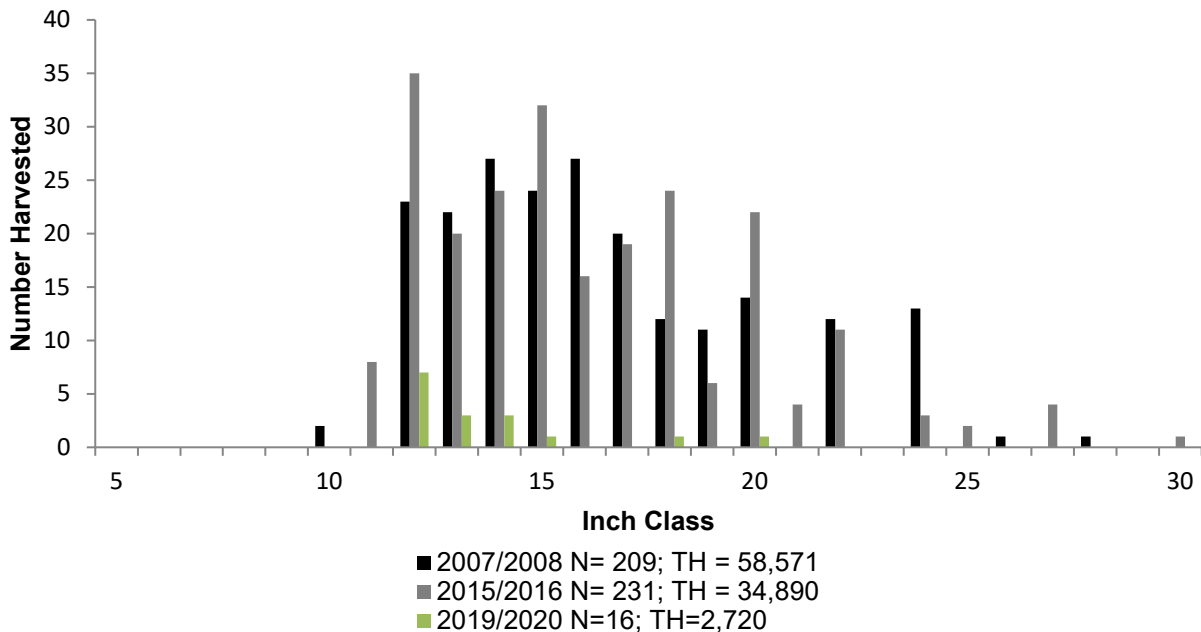


Figure 6. Length frequency of harvested Blue Catfish observed during creel surveys at Cedar Creek Reservoir, Texas, June 2007 through May 2008, June 2015 through May 2016 and June 2019 through February 2020, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

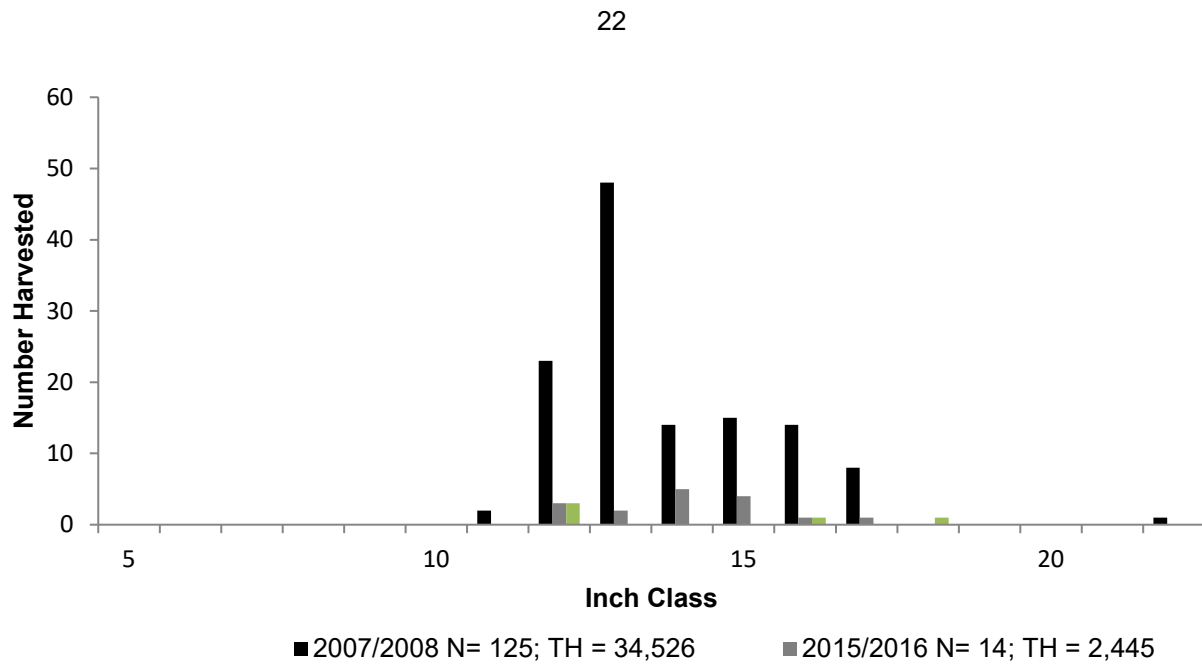


Figure 7. Length frequency of harvested Channel Catfish observed during creel surveys at Cedar Creek Reservoir, Texas, June 2007 through May 2008, June 2015 through May 2016 and June 2019 through February 2020, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.



## White Bass

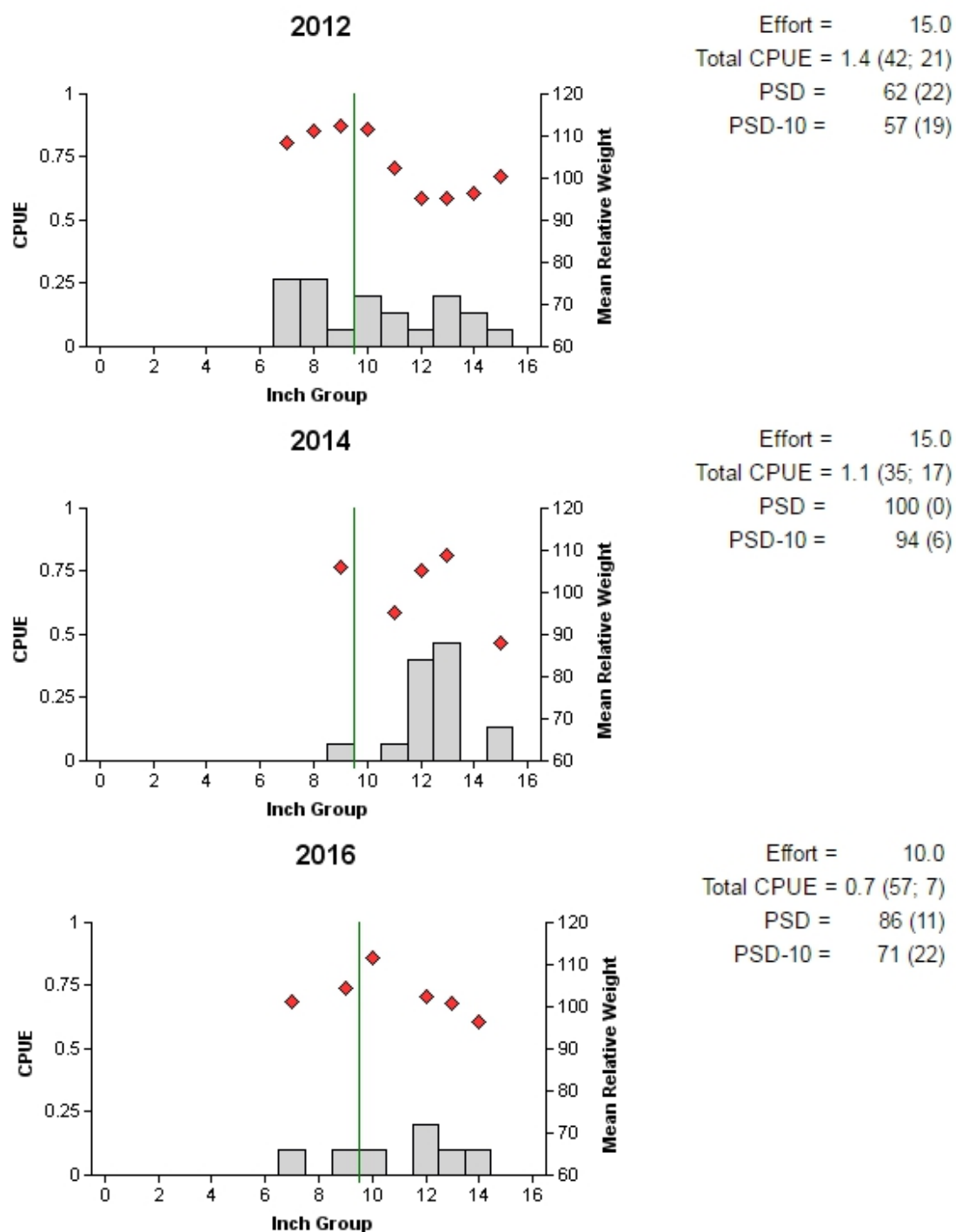


Figure 8. Number of White Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cedar Creek Reservoir, Texas, 2012, 2014, and 2016. Vertical line indicates minimum length limit.

## Hybrid Striped Bass

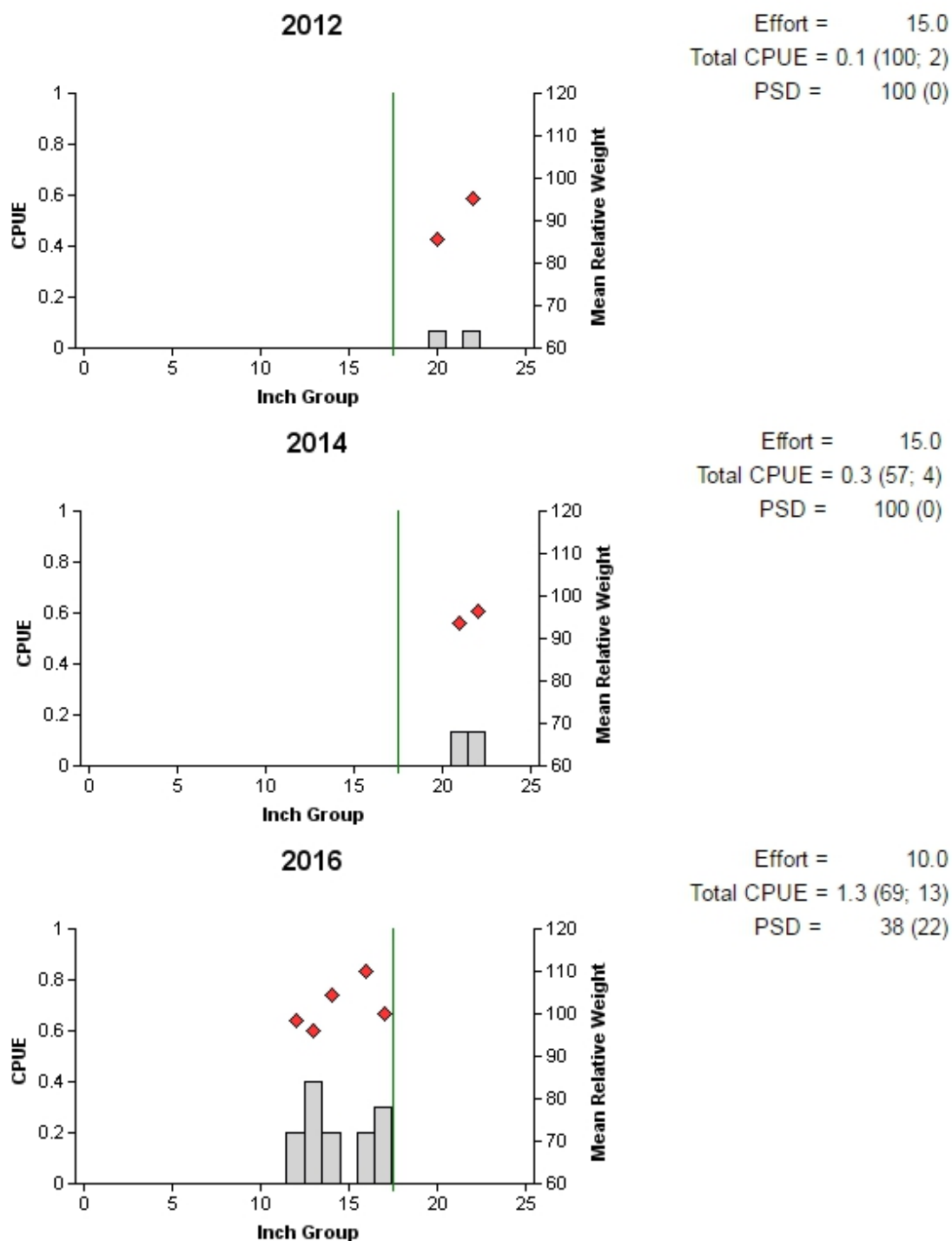


Figure 9. Number of Hybrid Striped Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cedar Creek Reservoir, Texas, 2012, 2014, and 2016. Vertical line indicates minimum length limit.

Table 10. Creel survey statistics for temperate bass at Cedar Creek Reservoir, Texas, from June 2007 through May 2008, June 2015 through May 2016, and June 2019 through February 2020. Total catch per hour is for anglers targeting temperate bass and total harvest is the estimated number of harvested temperate bass by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2007/2008	2015/2016	2019/2020
Surface area (acres)	31,813	32,132	32,623
Directed effort (h)	23,416 (37)	8,877 (37)	4,512 (65)
Directed effort/acre	0.7 (37)	0.3 (37)	0.1 (65)
Total catch per hour	2.5 (47)	2.5 (39)	1.1 (118)
Total harvest	18,239 (58)	10,021 (82)	3,210 (102)
White Bass	16,547 (46)	8,964 (66)	3,210 (102)
Hybrid Striped Bass	1,692 (172)	1,057 (217)	0
Harvest/acre	0.6 (58)	0.31 (82)	0.10 (102)
Percent legal released		44	87

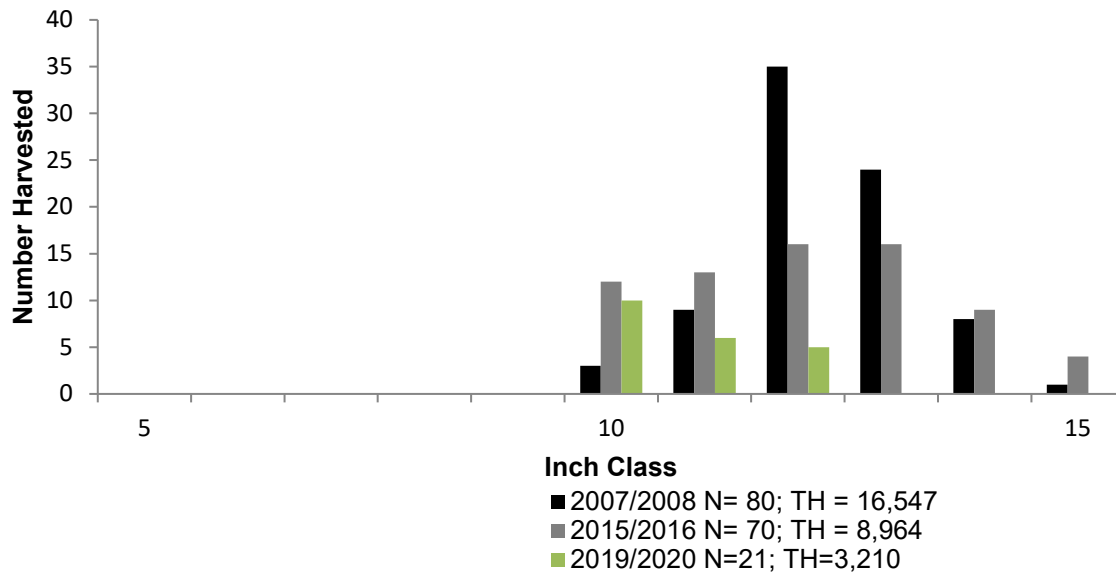


Figure 10. Length frequency of harvested White Bass observed during creel surveys at Cedar Creek Reservoir, Texas, June 2007 through May 2008, June 2015 through May 2016 and June 2019 through February 2020, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Largemouth Bass

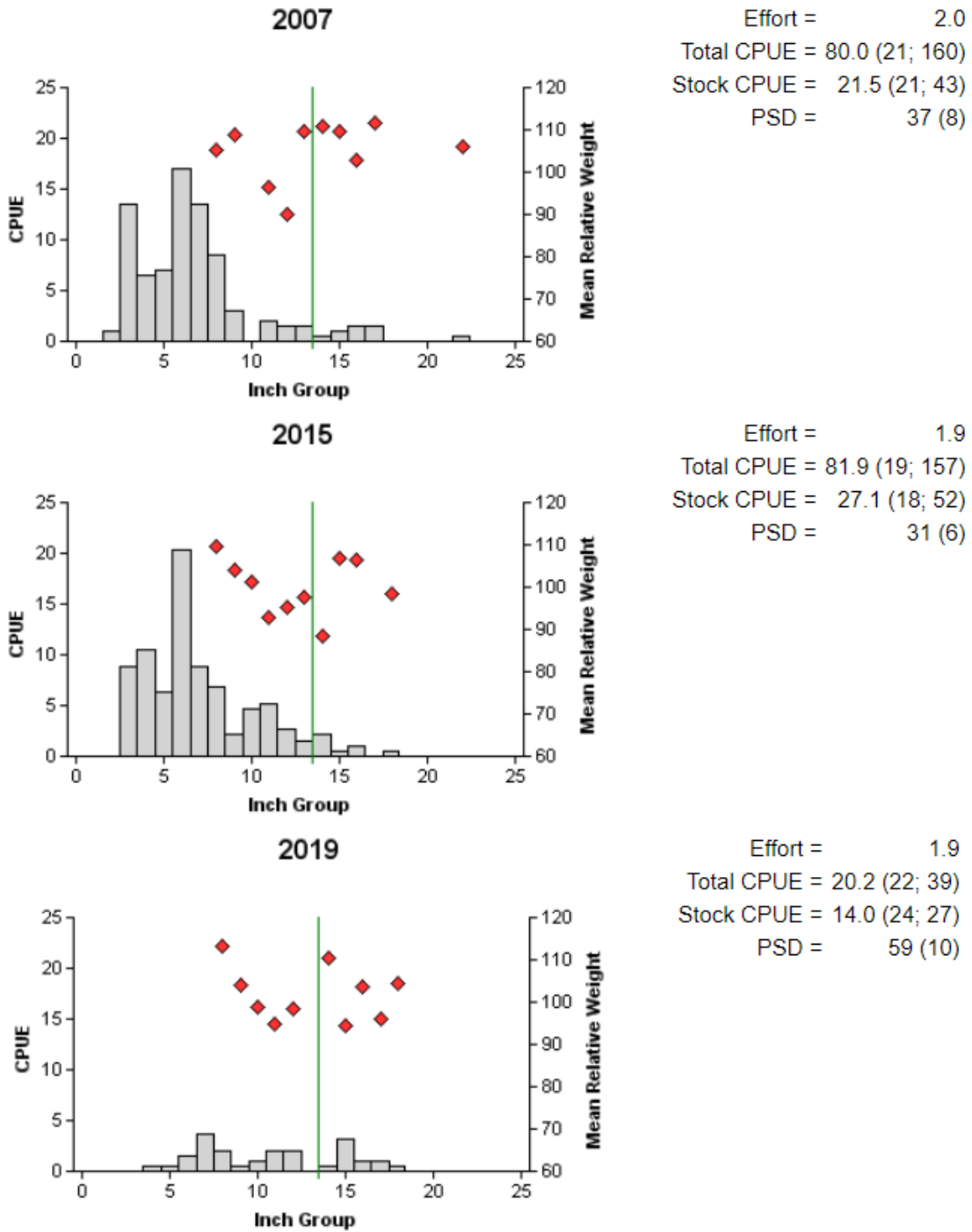


Figure 11. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cedar Creek Reservoir, Texas, 2007, 2015, and 2019. Vertical line indicates minimum length limit.

Table 11. Creel survey statistics for Largemouth Bass at Cedar Creek Reservoir, Texas, from June 2007 through May 2008, June 2015 through May 2016, and June 2019 through February 2020. 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		
	2007/2008	2015/2016	2019/2020
Surface area (acres)	31,813	32,132	32,623
Directed angling effort (h)			
Tournament		12,046 (53)	8,332 (62)
Non-tournament		33,042 (30)	7,627 (58)
All Largemouth Bass anglers combined	51,852 (25)	45,088 (29)	15,959 (56)
Angling effort/acre	1.6 (25)	1.4 (29)	0.5 (56)
Catch rate (number/h)	0.6 (25)	0.7 (23)	0.8 (19)
Harvest			
Non-tournament harvest	1,404 (48)	506 (249)	0
Harvest/acre	0.3 (48)	<0.1 (249)	0
Tournament weigh-in and release	7,373 (48)	3,050 (88)	2,536 (99)
Release by weight			
<4.0 lbs		23,216 (79)	13,391 (72)
4.0-6.9 lbs		1,402 (88)	702 (91)
7.0-9.9 lbs		126 (106)	0 (0)
≥10.0 lbs		0 (0)	0 (0)
Percent legal released (non-tournament)	83	87	100

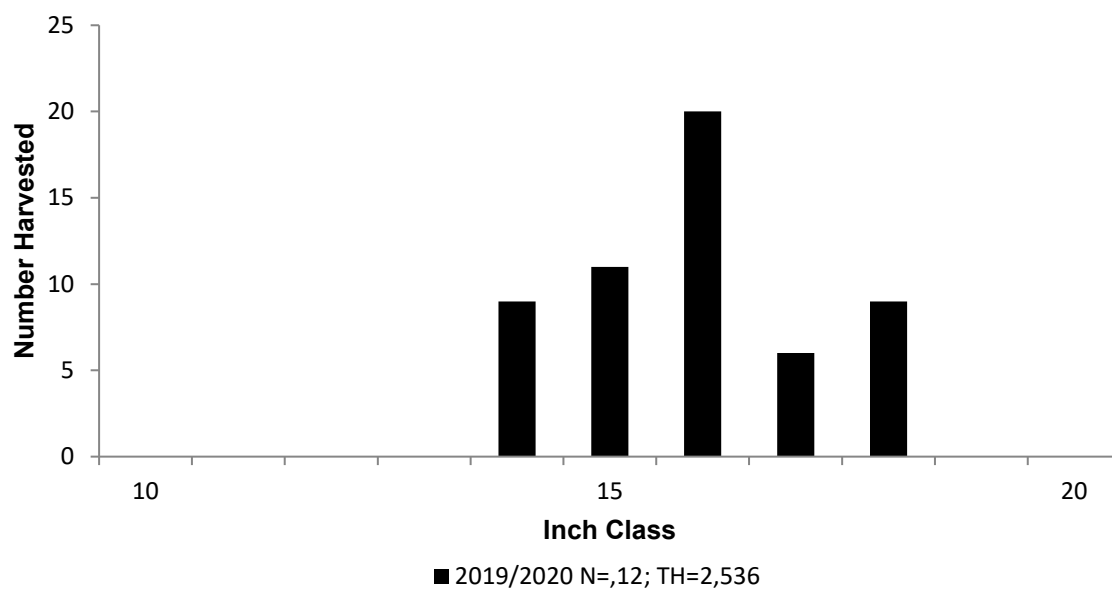


Figure 12. Length frequency of harvested Largemouth Bass observed during creel surveys at Cedar Creek Reservoir, Texas, June 2007 through May 2008, June 2015 through May 2016 and June 2019 through February 2020, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

### White Crappie

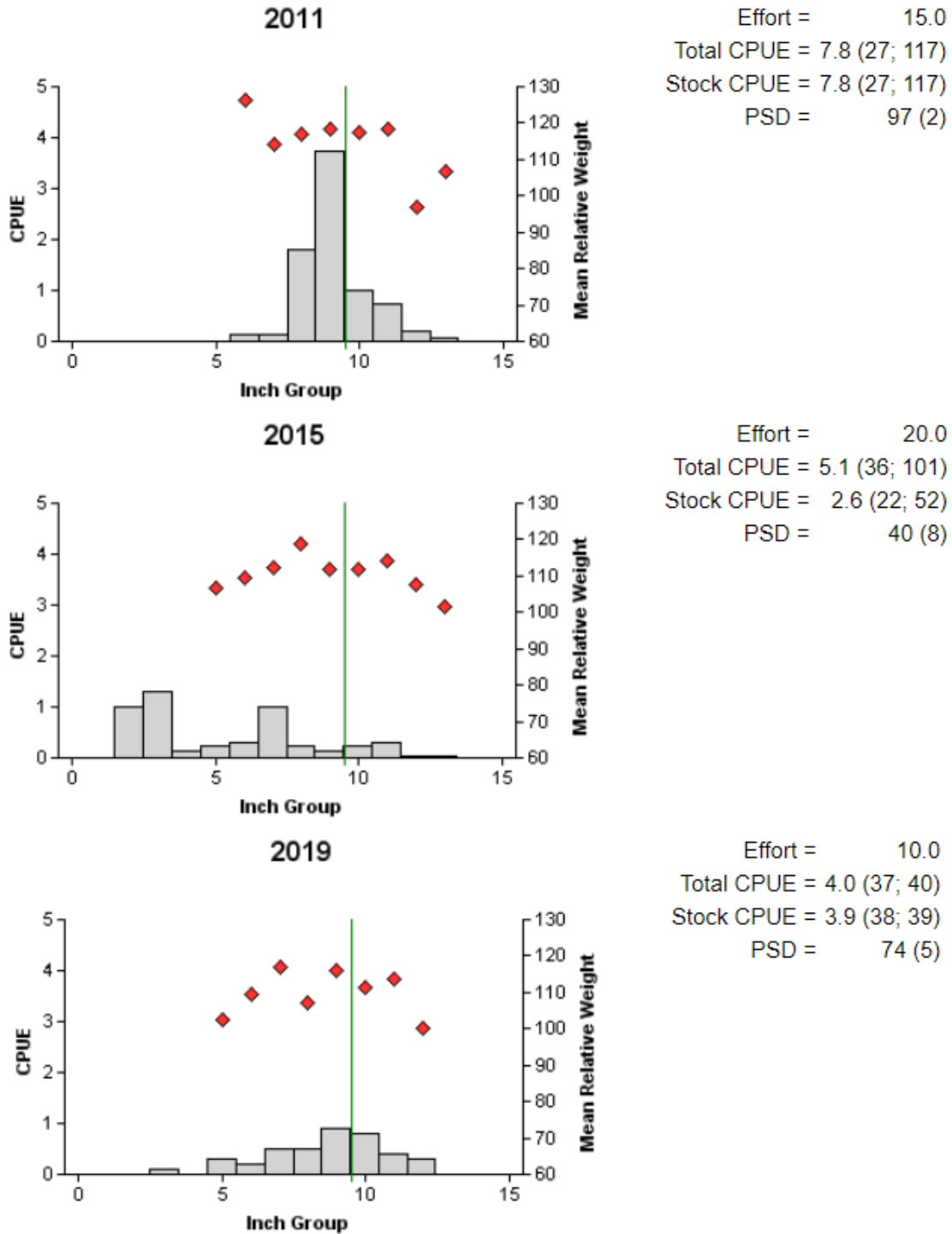
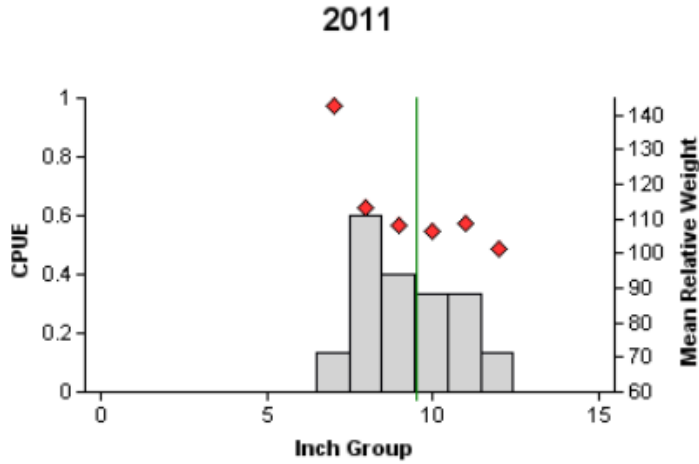


Figure 13. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Cedar Creek Reservoir, Texas, 2011, 2015, and 2019. Vertical line indicates minimum length limit.

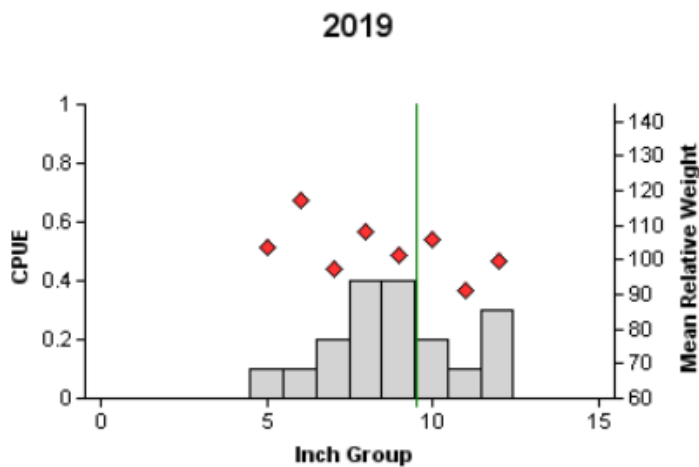
### Black Crappie



Effort = 15.0  
 Total CPUE = 1.9 (34; 29)  
 Stock CPUE = 1.9 (34; 29)  
 PSD = 93 (5)



Effort = 20.0  
 Total CPUE = 2.9 (31; 57)  
 Stock CPUE = 2.2 (30; 43)  
 PSD = 84 (8)



Effort = 10.0  
 Total CPUE = 1.8 (30; 18)  
 Stock CPUE = 1.8 (30; 18)  
 PSD = 78 (13)

Figure 14. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Cedar Creek Reservoir, Texas, 2011, 2015, and 2019. Vertical line indicates minimum length limit.



Table 12. Creel survey statistics for crappie at Cedar Creek Reservoir, Texas, from June 2007 through May 2008, June 2015 through May 2016, and June 2019 through February 2020. Catch rate is for all anglers targeting crappie and total harvest is the estimated number of harvested crappie by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2007/2008	2015/2016	2019/2020
Surface area (acres)	31,813	32,132	32,623
Directed effort (h)	22,781 (25)	22,941 (31)	30,950 (47)
Directed effort/acre	0.7 (25)	0.7 (31)	0.9 (47)
Total catch per hour	1.3 (68)	1.5 (31)	1.0 (50)
Total harvest	22,051 (79)	38,973 (65)	31,920 (59)
White Crappie	11,578 (76)	4,702 (87)	16,772 (60)
Black Crappie	10,473 (82)	34,271 (62)	15,148 (58)
Harvest/acre	0.7 (44)	1.2 (65)	0.9 (59)
Percent legal released	54	2	0

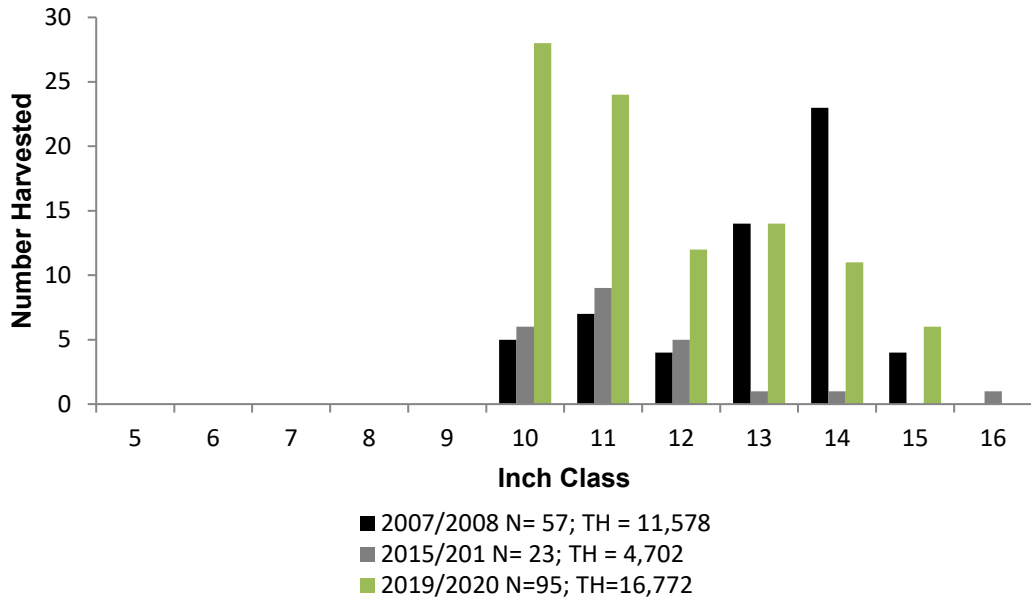


Figure 15. Length frequency of harvested White Crappie observed during creel surveys at Cedar Creek Reservoir, Texas, June 2007 through May 2008, June 2015 through May 2016 and June 2019 through February 2020, all anglers combined. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

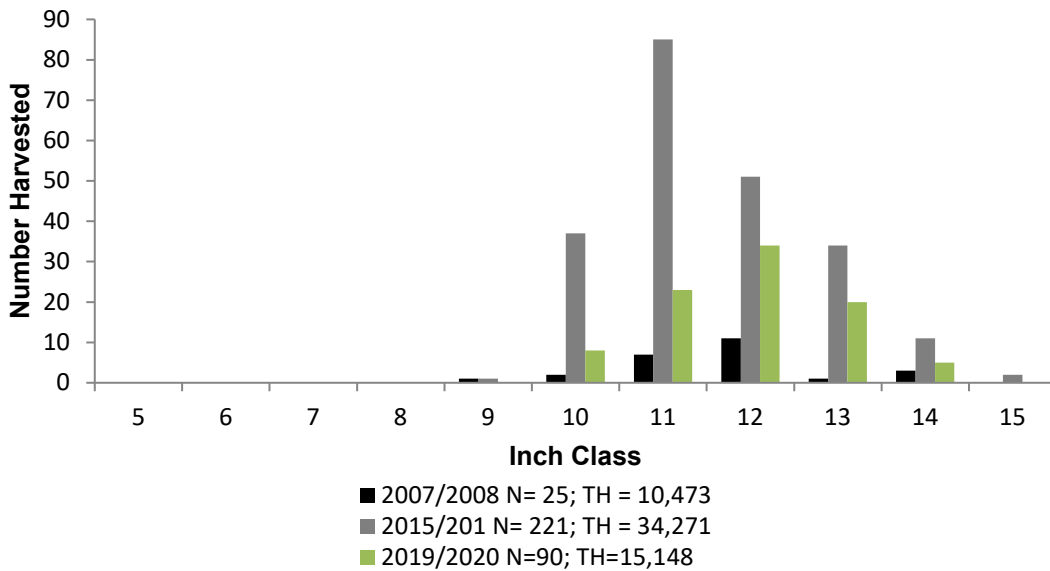


Figure 16. Length frequency of harvested Black Crappie observed during creel surveys at Cedar Creek Reservoir, Texas, June 2007 through May 2008, June 2015 through May 2016 and June 2019 through February 2020, all anglers combined. N is the number of harvested Black Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Proposed Sampling Schedule

Table 13. Proposed sampling schedule for Cedar Creek Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

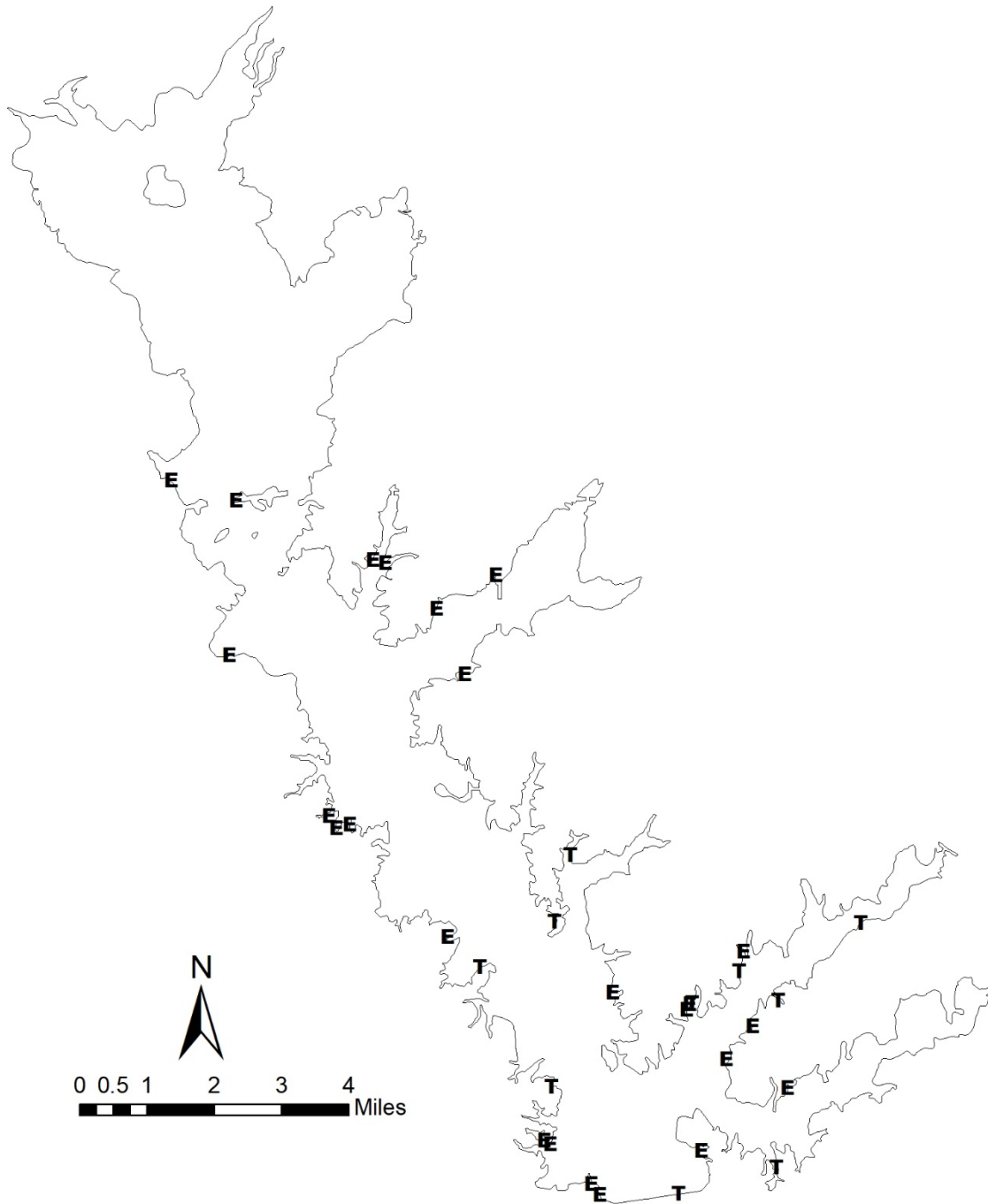
	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Vegetation				S
Electrofishing – Fall				S
Trap netting				S
Gill netting				S
Creel survey				S
Report				S

## 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 Cedar Creek Reservoir, Texas, 2019-2020. Sampling effort was 10 net nights for trap netting and 1.93 hours for electrofishing.

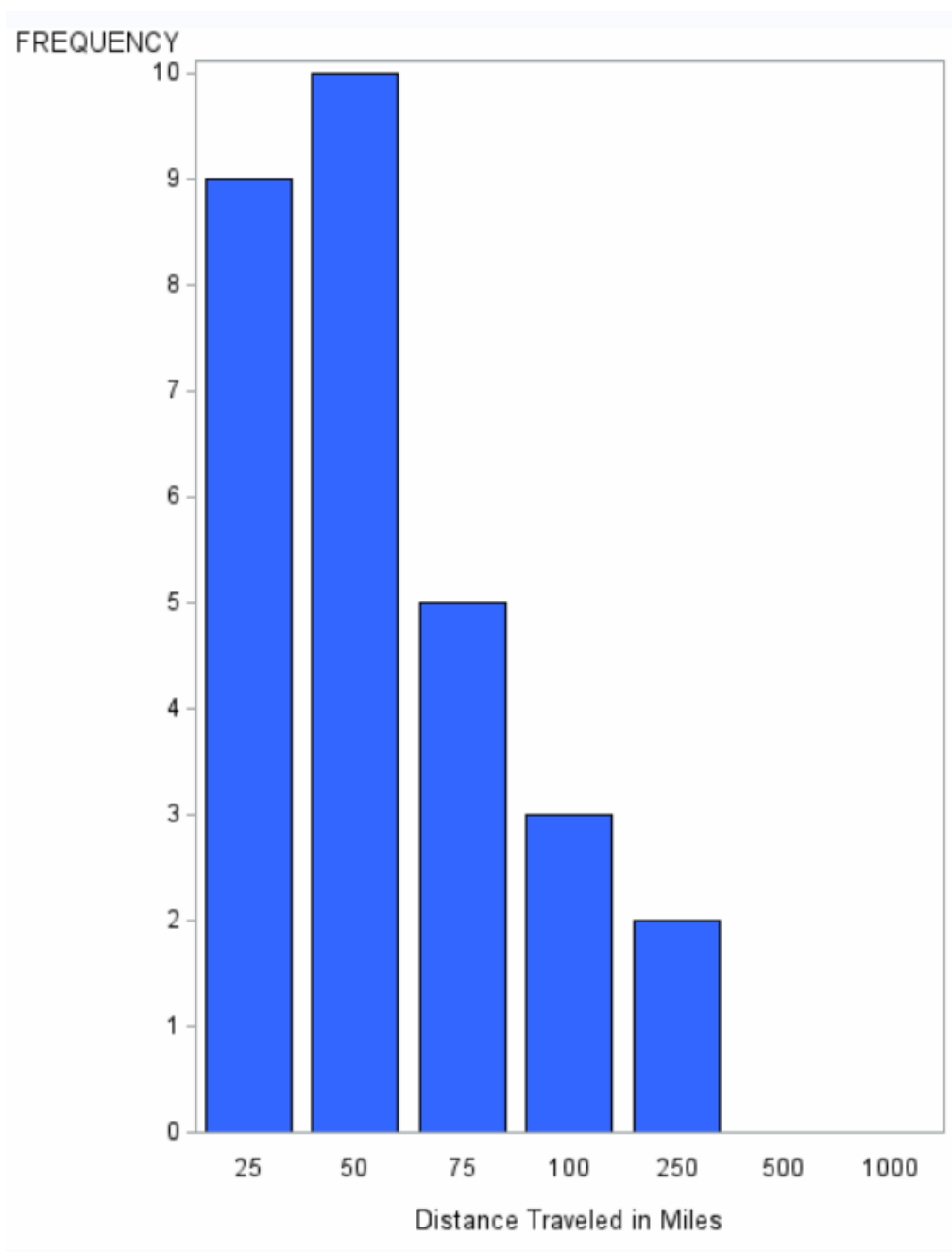
Species	Trap Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			579	299.5 (29)
Threadfin Shad			2,137	1,105.3 (39)
Bluegill			93	48.1 (26)
Longear Sunfish			15	7.8 (52)
Redear Sunfish			1	0.5 (100)
Largemouth Bass			39	20.2 (22)
White Crappie	40	4.0 (37)		
Black Crappie	18	1.8 (30)		

## APPENDIX B – Map of sampling locations



Location of sampling sites, Cedar Creek Reservoir, Texas, 2019-2020. Trap net and electrofishing stations are indicated by T and E, respectively. Water level was near full pool at time of sampling.

## APPENDIX C – reporting of creel ZIP code data



Frequency of anglers that traveled various distances (miles) to Cedar Creek Reservoir, Texas, as determined from the June 2019 through May 2020 creel survey.



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