E. V. Spence Reservoir

2019 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in E. V. Spence Reservoir were surveyed in 2017 and 2019 using electrofishing, inn 2019 using trap netting, and in 2018 and 2020 using gill netting. Historical data are presented with the 2017-2020 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: E. V. Spence Reservoir is a 14,950-acre reservoir located on the Colorado River near Robert Lee, Coke County, Texas. It has a history of prolonged water level declines and has never filled to conservation pool. Golden alga *Prymnesium parvum* blooms caused substantial fish kills in the 2000's that effectively eliminated the fish community. Subsequently, low and moderate toxic conditions have been recorded on an annual basis.

Management History: The management of this reservoir has been impacted by chronic toxic golden alga blooms since 2001 and persistent low water levels. Florida strain Largemouth Bass, White Crappie, White bass, Bluegill, and Blue Catfish were stocked in years following significant water level rises in 2015 and 2018.

Fish Community

- **Prey species:** Electrofishing catch of Gizzard Shad was higher than historical levels and most Gizzard Shad were available as prey. Electrofishing catch of Bluegill was low and similar to previous surveys.
- **Catfishes:** The Blue Catfish population had the highest gill net catch rate on record, owing to stockings from 2016 to 2019. The catch rate of Channel Catfish significantly declined from 2016 to 2020. No Flathead Catfish were observed during sampling.
- **Temperate basses:** White Bass were present in the reservoir in low abundance. White Bass had not been collected over the previous two surveys.
- **Largemouth Bass:** Largemouth Bass were very abundant with the highest electrofishing catch rate on record for E. V. Spence. A strong year-class of fish from 2018 dominated the sample. Growth was fast with fish averaging 1.5 years old at 14 inches in 2017.
- **White Crappie:** White Crappie were in low abundance, but presence of young crappie indicated natural reproduction is occurring.

Management Strategies: Conduct additional electrofishing, trap netting, and gill netting surveys in 2021-2022, and general monitoring surveys with trap nets, gill nets, and electrofishing surveys in 2023-2024. Access and vegetation surveys will be conducted in 2023. An access-point creel survey will be conducted from June 2020 through May 2021.

Introduction

This document is a summary of fisheries data collected from E.V. Spence Reservoir in 2017-2020. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2017-2020 data for comparison.

Reservoir Description

E. V. Spence Reservoir is a 14,950-acre impoundment constructed in 1969 on the Colorado River. It is located in Coke County near the town of Robert Lee and is approximately 45 miles north of San Angelo. It has a history of prolonged low water level and has never filled to conservation pool. The highest recorded water level occurred on June 16, 1987 when the reservoir was at 69% capacity and 12.5 feet below conservation pool. The reservoir is operated and controlled by the Colorado River Municipal Water District (CRMWD). Primary water uses included water supply and recreation. Land use around the reservoir is primarily pastureland. Golden alga *Prymnesium parvum* blooms occurred during winters from 2001-2011 (Appendix C) and caused major fish kills in the reservoir that essentially eliminated the fish community. In the years following the severe golden alga blooms, the reservoir suffered from extreme low water conditions. From 2011 to 2015 the reservoir remained below 5% capacity, reaching its lowest recorded level on September 27, 2012 (0.2% capacity and 88 feet below conservation pool). Since 2012, low to moderate toxic conditions have been recorded, but these blooms have not resulted in any major fish kill, however, smaller fish kills limited primarily to Gizzard Shad have occurred in recent years. Water levels significantly improved in 2018 (Figure 1) due to record rainfall and reservoir capacity has increased to 27%, the highest observed levels since 1997. E. V. Spence Reservoir was listed as eutrophic with a mean TSI Chl-*a* of 60.86 (Texas Commission on Environmental Quality 2020). Other descriptive characteristics for E. V. Spence Reservoir are shown in Table 1.

Angler Access

E.V. Spence Reservoir has five public boat ramps located at three CRMWD parks. Rough Creek ramp has been closed indefinitely as the ramp has not been useable since 1993. The Wildcat recreation area has three ramps built at different elevations to allow for use at different water levels. Bank access is good around ramps and CRMWD maintained day-use areas. Day pass fee is required at all ramps. Additional boat ramp characteristics are in Table 2.

Management History

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

1. Rebuild the fishery through a combination of hatchery and management stockings. Monitor the fishery recovery through biennial sampling with electrofishing, gill netting, and trap netting. Continue to monitor golden alga levels by taking a minimum of two samples between November 1 and March 31.

   Action: Florida strain Largemouth Bass were stocked annually from 2016 to 2019. Management stockings of White Crappie occurred in 2016 and 2019. Bluegill were stocked in 2016. Blue Catfish were stocked from 2016-2019. Electrofishing, gill netting, and trap netting surveys were completed, and golden alga samples were collected as planned.

2. Cooperate with the CRMWD to post signage, educate the public about invasive species, and track existing and future inter-basin water transfers to facilitate potential invasive species responses.

   Action: The San Angelo District continued to work with the CRMWD to post signage and to educate the public on invasive species threats through media outlets.

Harvest regulation history: Sport fish in E. V. Spence Reservoir are currently managed with statewide regulations (Table 3).

Stocking history: Striped Bass were stocked nearly every year from 1969 to 2000. Florida-strain Largemouth Bass were stocked frequently since 2000. No stockings occurred from 2009 to 2012 due to low water and toxic golden alga blooms. The complete stocking history is shown in Table 4.

Vegetation/habitat management history: E. V. Spence Reservoir has no significant vegetation/habitat management history.

Water transfer: The CRMWD uses this reservoir as one of its three major sources of surface water. The District provides raw water (non-potable) to rural users and municipal and industrial (oil/gas) customers. Municipal customers include the cities of Big Spring, Snyder, Stanton, Midland, and Odessa. The City of Robert Lee also uses this reservoir for their raw water source. The City of San Angelo also has infrastructure at this reservoir capable of pumping water for their municipal needs. Their facility has not been used since the early 2000's. There are no inter-basin transfers. Historically, transfers occurred between E. V. Spence, Colorado City Reservoir, and Moss Creek City Reservoir.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for E. V. Spence Reservoir (Wright 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, and Gizzard Shad 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 13 randomly-selected fish (range 13.0 to 14.9 inches).

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).

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

Genetics – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017). Micro-satellite DNA analysis was used to determine genetic composition of individual fish since 2005. Electrophoresis analysis was used prior to 2005.

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 statistics.

Habitat –A vegetation survey was conducted in 2019.

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

Results and Discussion

Habitat: A structural habitat survey was last conducted in 2007 (Farooqi and Scott 2008). At that time, the littoral zone habitat consisted primarily of flooded terrestrial vegetation (62.4%) and rocky shoreline (20.9%). Flooded terrestrial habitat was also abundant in 2019 following a significant water level rise in 2018. No aquatic vegetation was observed in 2019 and historically this reservoir has not supported aquatic vegetation.

Golden Alga: Golden alga cell densities and toxicity have been lower over the past four years compared to historical conditions from 2001- 2011 (Appendix C). Generally, over the past four years, cell densities have remained under 20,000 cells/ml and toxicity levels have ranged from low to moderate. This level of golden alga toxicity has resulted in minor fish kills consisting primarily of Gizzard Shad, though loss of some game fish has been reported. This level of golden alga has not resulted in major losses, as evidenced by record sampling catch rates of Largemouth Bass, Blue Catfish and Gizzard Shad in recent surveys.

Prey species: Electrofishing catch rates of Gizzard Shad were 278.0/h in 2019, which was down slightly from 385.3/h in 2017, but better than 151.3/h in 2015. Index of Vulnerability (IOV) for Gizzard Shad was good in 2019, indicating that 88% of Gizzard Shad were available to existing predators and has improved over the past three surveys (Figure 2). Total CPUE of Bluegill in 2019 was 45.0/h which was low and

similar to past surveys (Figure 3). Bluegill size structure has increased, and most Bluegill sampled were from 5 to 7 inches. Overall, sunfish species were not abundant, only Bluegill, Green Sunfish, and Longear Sunfish were collected, and total catch rate was 63.0/h.

Blue Catfish: Total CPUE of Blue Catfish was 15.9/nn in 2020, which was the highest catch rate on record for Blue Catfish among San Angelo area reservoirs. Sizes of Blue Catfish ranged from 9 to 22 inches. Condition of Blue Catfish over 14 inches was excellent with relative weights ranging from 100 to 110 (Figure 4). Blue Catfish abundance was very low following golden alga kills and low water levels from 2001 to 2015 with total gill net catch rate <1.0/nn in 2016 and 2018. To re-establish the Blue Catfish population, a total of 546,338 fingerlings were stocked from 2016 to 2019. Survival of stocked Blue Catfish fingerlings appears to have been excellent as evident by the high catch rates observed in 2020.

Channel Catfish: The gill net catch rate of Channel Catfish has declined from 5.4/nn in 2016, to 1.3/nn in 2018, to 0.1/nn in 2020 (Figure 5). It is unclear why the Channel Catfish gill net catch rates have declined, but it's possible the decline could be related to competition with the expanding Blue Catfish population. Due to lower than expected catch rates, survey objectives for the precision of abundance estimates and total fish collected for size structure were not met.

White Bass: Only two white bass from 10- to 11-inches were collected in gill nets in 2020 (Figure 6). White Bass were not observed during gill netting in 2016 or 2018. A management stocking of 60 adult White Bass was conducted in 2016. While the gill net catch rate was low, anecdotal evidence from anglers, who have reported multiple catches of legal-size White Bass, would indicate the population is improving.

Largemouth Bass: The electrofishing catch rate of Largemouth Bass over 8 inches was 165.0/h in 2019 and was significantly higher than recent surveys in 2017 (65.0/h) and 2015 (38.0/h; Figure 7). Size structure was low (PSD = 8) however, this was due to the high abundance of stock-size fish present in the sample. The catch rate of 9-inch bass alone was 82.0/h in 2019 and examination of a sub-sample of those fish showed all were age-1 fish from the 2018 year-class. Condition was average in 2019 as most inch groups had relative weights in the low 90's (Figure 7). Growth of Largemouth Bass in E. V. Spence Reservoir was fast in 2017; average age at 14 inches (13.0 to 14.9 inches) was 1.5 years (N = 13; range = 1-2 years). Florida Largemouth Bass influence was very high. Florida alleles were 94% and Florida genotype was 70% (Table 6).

White Crappie: The trap net catch rate of White Crappie was 1.0/nn in 2019, with fish ranging from 4 to 7 inches (Figure 8). The crappie population was significantly impacted by golden alga and low water levels from 2001 to 2015. Management stockings of adult White Crappie occurred in 2016 (N = 147) and 2019 (N = 250) to help re-establish the population. The presence of young crappie indicate natural reproduction is occurring. It is expected that the numbers and sizes of White Crappie will continue to improve in the coming years.

Fisheries Management Plan for E. V. Spence Reservoir, Texas

Prepared – July 2020

ISSUE 1: The Largemouth Bass population has greatly improved since 2013 owing to increased water levels, abundant habitat, fish stockings, and low golden alga levels. E. V. Spence has become a popular location for bass tournaments in West Texas. Monitoring this population is a priority for our district.

MANAGEMENT STRATEGY

1. Conduct electrofishing surveys in fall 2021 and 2023 to assess the Largemouth Bass population and prey base.
2. Assess genetics in 2023
3. Conduct year-long access creel survey from June 2020 through May 2021.

ISSUE 2: The development of the Blue Catfish population, following fingerling stockings from 2016-2019, has been exceptional. Gill net catch rates in spring 2020 were the highest on record for San Angelo area reservoirs. Additional sampling is necessary to monitor for improvements in the population and document evidence of natural reproduction.

MANAGEMENT STRATEGIES

1. Conduct gill net surveys in 2022 and 2024 to monitor the Blue Catfish population.
2. Document potential Blue Catfish effort and harvest during a year-long access creel survey from June 2020 through May 2021.

ISSUE 3: Historically, Striped Bass were the most popular sportfish in E. V. Spence Reservoir and was one of the earliest reservoirs in Texas to receive Striped Bass in 1969. The reservoir was stocked nearly every year following construction from 1969 to 2000 (Table 4). From 1989-1999, over 50% of all angler effort was directed at Striped Bass which averaged over six hours per acre (Appendix D). Golden alga and low water levels severely impacted the reservoir from 2001-2015 and Striped Bass stockings were discontinued after 2007. However, water levels significantly improved in 2015 and 2018 and the reservoir is currently at its highest level since 1997. Additionally, E. V. Spence has not experienced a major golden bloom since 2013. Current reservoir conditions are adequate to bring back a Striped Bass fishery, however, Striped Bass fingerlings may be difficult to acquire. Hybrid Striped Bass may be more suitable for E.V. Spence Reservoir and be more readily available for stocking, but further evaluation of angler opinions is needed before any management action can be taken.

MANAGEMENT STRATEGY

1. Conduct an angler opinion survey to evaluate interest in stocking Striped Bass or hybrid Striped Bass to E.V. Spence Reservoir.

2. Continue to monitor golden alga levels from November-March annually. Consider stocking Striped Bass or hybrid Striped Bass at low density (5 fingerlings per acre) if golden alga levels

remain low, Gizzard Shad abundance remains adequate (CPUE-Total > 200/h), and the reservoir water levels remain above 4,000 surface acres.

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 (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the 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 (2021–2024)

Sport fish, forage fish, and other important fishes

Sport fishes in E.V. Spence include Blue and Channel Catfish, White Crappie, White Bass, and Largemouth Bass. Known important forage species include Gizzard Shad and Sunfish species.

Low-density fisheries

Channel Catfish: Channel Catfish are present in E. V. Spence Reservoir, but population abundance is low. Gill net CPUE of stock-size fish have declined to ≤ 1.0/nn. Sampling Channel Catfish is not necessary in FY 2021-2024; however, length/weight data may be collected during Blue Catfish gill net sampling.

White Bass: White Bass are present in E. V. Spence Reservoir, but population abundance is low. Sampling White Bass is not necessary in FY 2021-2024; however, length/weight data may be collected during Blue Catfish gill net sampling.

Survey objectives, fisheries metrics, and sampling objectives

Creel Survey: An access-point creel survey will be conducted from June 2020 through May 2021. Angler interviews will be 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).

Largemouth Bass: Largemouth Bass catch rates in 2019 were the highest in record for E. V. Spence. Many bass tournaments have returned to the reservoir and overall angler effort has picked up following poor reservoir conditions from 2001-2015. The reservoir is at its highest water levels since 1997 and submerged terrestrial habitat is abundant. Monitoring the Largemouth Bass population is necessary due to its ongoing recovery and development. Our objectives are to monitor trends in abundance, size structure, condition, and growth. Continuation of biennial trend data in this reservoir with night electrofishing in the fall will allow for determination of any large-scale changes in the Largemouth Bass population. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in fall 2021 and 2023 (Table 7). Sampling objectives are to obtain 50 stock-size fish for size structure estimation and an RSE of CPUE-Stock $\leq$ 25. Twelve random stations will be sampled, and six additional random stations will be pre-determined in the event some extra sampling is necessary. A maximum of 18 stations will be sampled. Fin samples will be taken from 30 fish and submitted for genetic analysis in 2023. Otoliths from 13 fish between 13.0 and 14.9 inches will be collected to determine mean age at 14 inches in 2023.

White Crappie: The White Crappie population remains in low abundance and is still recovering from low water and golden alga. Management stockings in 2016 and 2019 have helped re-establish a breeding population but monitoring needs to continue to document population recovery. Ten randomly selected trap net sites will be sampled in 2021 and 2023 (Table 7). Since the population is recovering, no sampling objectives will be established, and sampling will be considered exploratory.

Blue Catfish: Blue Catfish fingerlings were stocked from 2016-2019 and an excellent fishery has started to develop. Blue Catfish catch rates in spring 2020 were the highest in record for the San Angelo District and indicate excellent survival of stocked fish. Monitoring the development of this fishery is a high priority. Our objectives will be to collect 50 stock-size fish for size structure analysis and achieve a CPUE-Stock RSE ≤ 25. A minimum of 10 randomly selected stations will be sampled in 2022 and 2024 (Table 7). Based on recent sampling results, 10 nets should be adequate to meet these objectives. However, 5 additional random stations will be pre-determined in the event some extra sampling is necessary. A maximum of 15 gill net stations will be sampled.

Gizzard Shad and Bluegill: Gizzard Shad and Bluegill are the primary forage fish in E. V. Spence Reservoir. Sampling effort based on sampling objectives for Largemouth Bass will be sufficient to determine IOV and CPUE-Total of Gizzard Shad and CPUE-Total and size structure of Bluegill. No additional sampling effort will be expended to achieve an RSE ≤ 25 for CPUE-Total for Gizzard Shad or Bluegill.

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Tables and Figures

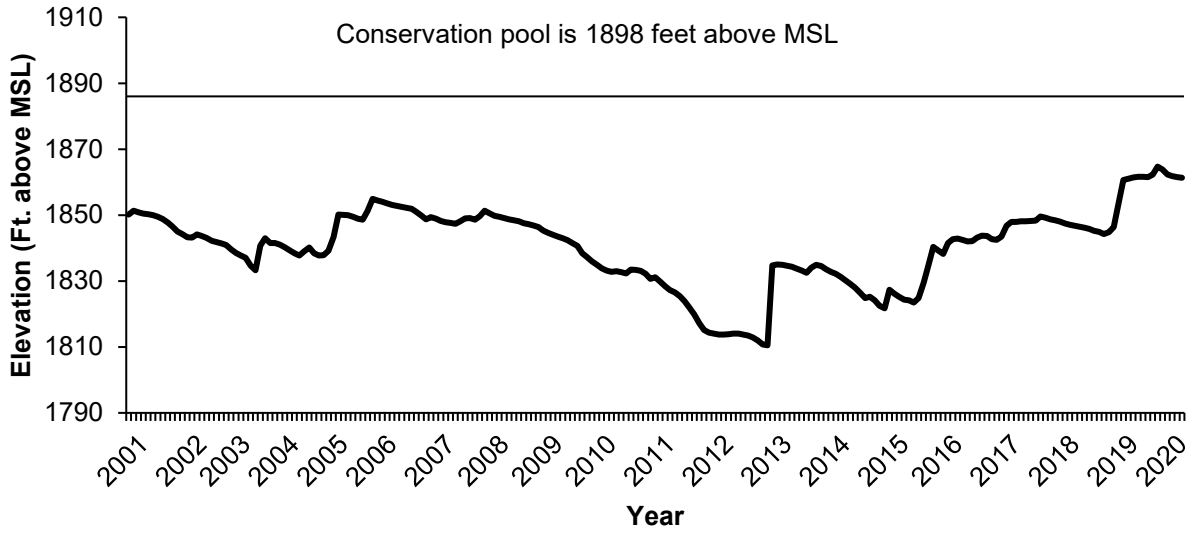


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for E. V. Spence Reservoir, Texas.

Table 1. Characteristics of E. V. Spence Reservoir, Texas.

Characteristic	Description
Year constructed	1969
Controlling authority	Colorado River Municipal Water District
County	Coke
Reservoir type	Mainstem of the Colorado River
Conductivity	2,100 – 3,500 µS/cm
Shoreline Development Index (SDI)	8.00
Watershed:surface area ratio	215:1

Table 2. Boat ramp characteristics for E.V. Spence Reservoir, Texas, October, 2019. Reservoir elevation at time of survey was 1,861 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Wildcat Recreation Area, Ramp #1	31.88601 -100.5323	Y	20	1852	Good. Extension is not feasible
Wildcat Recreation Area, Ramp #2	31.88883 -100.5311	Y	20	1848	Good. Extension is not feasible
Wildcat Recreation Area, Ramp #3	31.89137 -100.5338	Y	20	1838	Currently underwater
Paint Creek	31.91149 -100.5822	Y	20	1840	Good. Extension is not feasible
Rough Creek	31.97720 -100.5878	Y	20	1866	Out of water. Closed indefinitely

Table 3. Harvest regulations for E. V. Spence Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of E. V. Spence Reservoir, Texas. FGL = fingerling; ADL = adults; UNK = unknown.

Species	Year	Number	Size
Threadfin Shad	1980	4,000	UNK
	1981	3,000	UNK
	1982	1,200	UNK
	1984	5,700	UNK
	Total	13,900	
Blue Catfish	1971	4,325	UNK
	1973	13,000	UNK
	1979	120,359	UNK
	1980	42,228	UNK
	1981	49,996	UNK
	1988	15	ADL
	1992	60,810	FGL
	2002	2,715	FGL
	2004	125,000	FGL
	2016	83,482	FGL
	2017	95,294	FGL
	2018	197,185	FGL
	2019	170,377	FGL
	Total	964,786	
Channel Catfish	1968	138,000	UNK
	1969	87,650	UNK
	1970	16,000	UNK
	1971	34,200	UNK
	1972	10,000	UNK
	2003	132,861	FGL
	2004	85,471	FGL
	2005	187,342	FGL
	2006	233,974	FGL
	2007	183,235	FGL
	2008	162,061	FGL
	2013	108,139	FGL
	Total	1,378,933	
Flathead Catfish	1969	26	UNK
	1971	1,825	UNK
	1973	4,000	UNK
	2019	10,513	FGL
	Total	16,364	
White Bass	1982	100	UNK
	2016	60	ADL
	Total	160	

Table 4. Stocking History Continued

Species	Year	Number	Size
Striped Bass	1969	34,500	FGL
	1970	3,000	FGL
	1971	47,328	FGL
	1972	51,835	FGL
	1973	69,834	FGL
	1974	51,075	FGL
	1975	82,068	UNK
	1976	34,975	UNK
	1977	29,698	UNK
	1979	30,525	UNK
	1981	84,182	UNK
	1982	50,000	UNK
	1984	119,500	FGL
	1986	105,384	FGL
	1988	2,000,000	FRY
	1988	150,274	FGL
	1990	152,136	FGL
	1991	68,644	FGL
	1992	62,700	FGL
	1993	107,545	FGL
	1993	62,950	FRY
	1994	17,500	FGL
	1995	71,346	FGL
	1996	10,403	FRY
	1996	24,794	FGL
	1997	25,229	FGL
	1998	25,223	FGL
	2000	15,010	FGL
	2004	27,041	FGL
	2005	37,243	FGL
	2007	35,774	FGL
	Total	3,670,216	
Palmetto Bass	1975	51,748	UNK
Bluegill	2002	301,201	FGL
	2005	374,684	FGL
	2006	239,789	FGL
	2007	180,800	FGL
	2008	176,660	FGL
	2016	84,066	FGL
	Total	1,357,200	
Smallmouth Bass	1980	500	UNK
	1981	146,817	UNK
	1982	144,837	UNK
	1985	258	ADL
	Total	292,412	

Table 4. Stocking History Continued

Species	Year	Number	Size
Largemouth Bass	1968	10,990	UNK
	1969	786,000	UNK
	1970	26,000	UNK
	1971	46,946	UNK
	1972	4,500	UNK
	1973	1,650	UNK
	2005	100,885	FGL
	Total	979,971	
Florida Largemouth Bass	1980	37,900	FGL
	1981	86,000	FGL
	1996	349,276	FGL
	2000	200,031	FGL
	2003	148,516	FGL
	2004	124,706	FGL
	2005	188,526	FGL
	2007	181,428	FGL
	2008	164,710	FGL
	2013	109,965	FGL
	2016	102,549	FGL
	2017	108,809	FGL
	2018	103,906	FGL
	2019	155,883	FGL
	2020	50,694	FGL
	Total	2,112,899	
White Crappie	2005	146	ADL
	2016	147	ADL
	2019	250	ADL
	Total	543	
Green X Redear Sunfish	1971	70,000	UNK
	1972	2,700	UNK
	Total	72,700	

Table 5. Objective-based sampling plan components for E. V. Spence Reservoir, Texas 2017–2020.

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 14 inches	N = 13, 13.0 – 14.9 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
Gill netting			
Blue Catfish	Abundance	CPUE-Total	exploratory
Channel Catfish	Abundance	CPUE–stock	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Condition	W_r	10 fish/inch group (max)
White Bass	Abundance	CPUE-Total	exploratory
Trap netting			
Crappie	Abundance	CPUE-Total	exploratory

[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.

Gizzard Shad

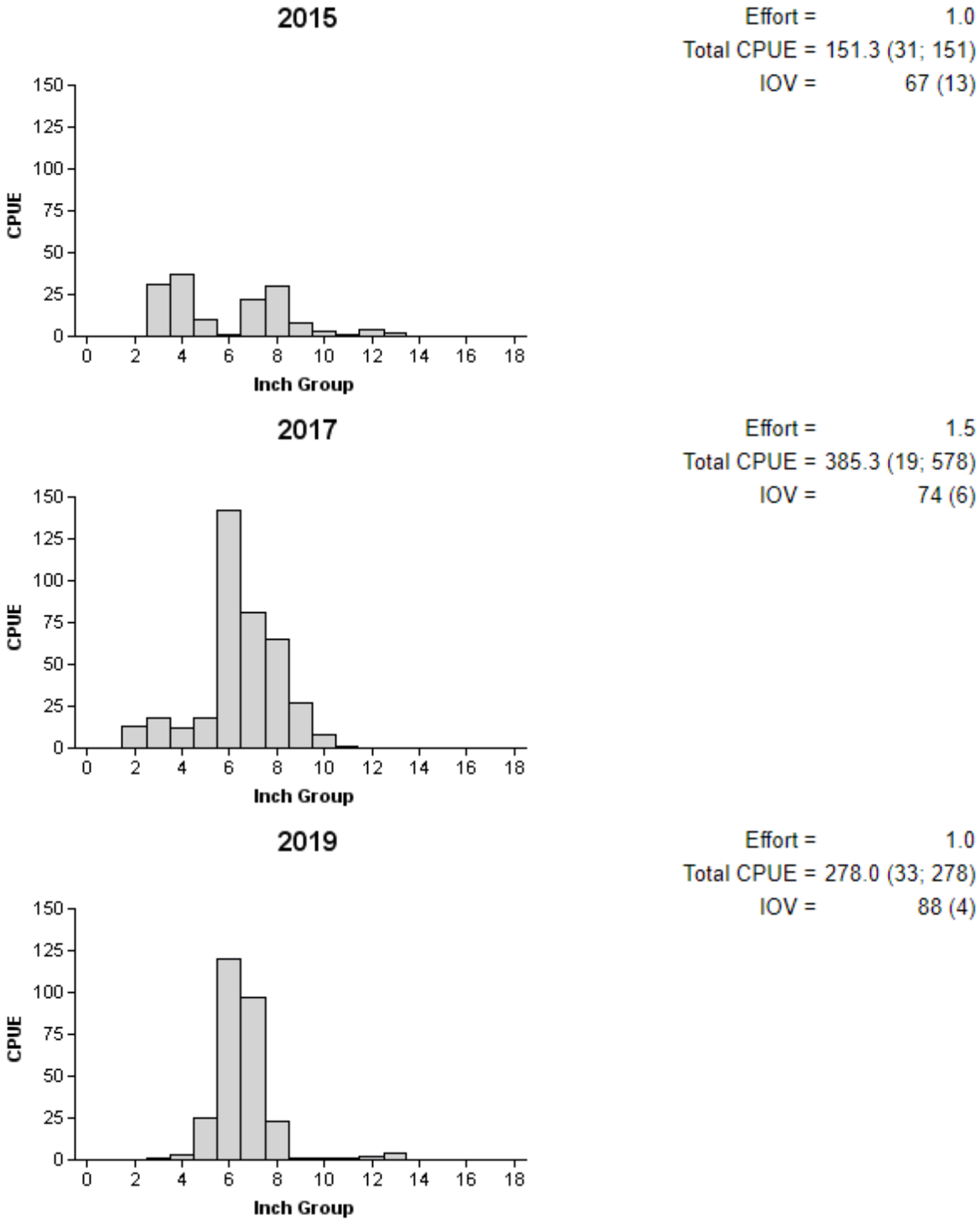


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, E.V Spence Reservoir, Texas, 2015, 2017, and 2019.

Bluegill

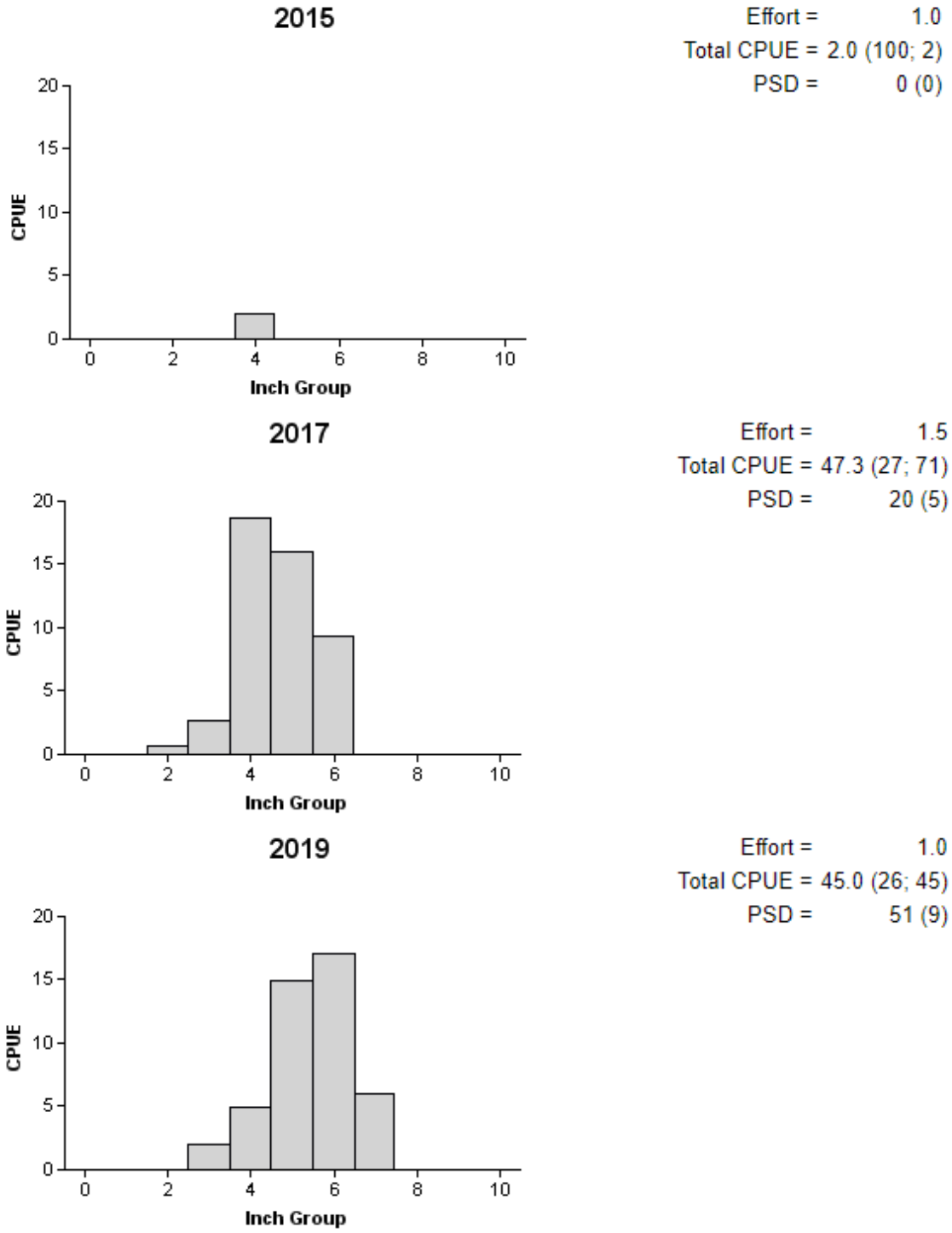


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, E.V. Spence Reservoir, Texas, 2015, 2017, and 2019.

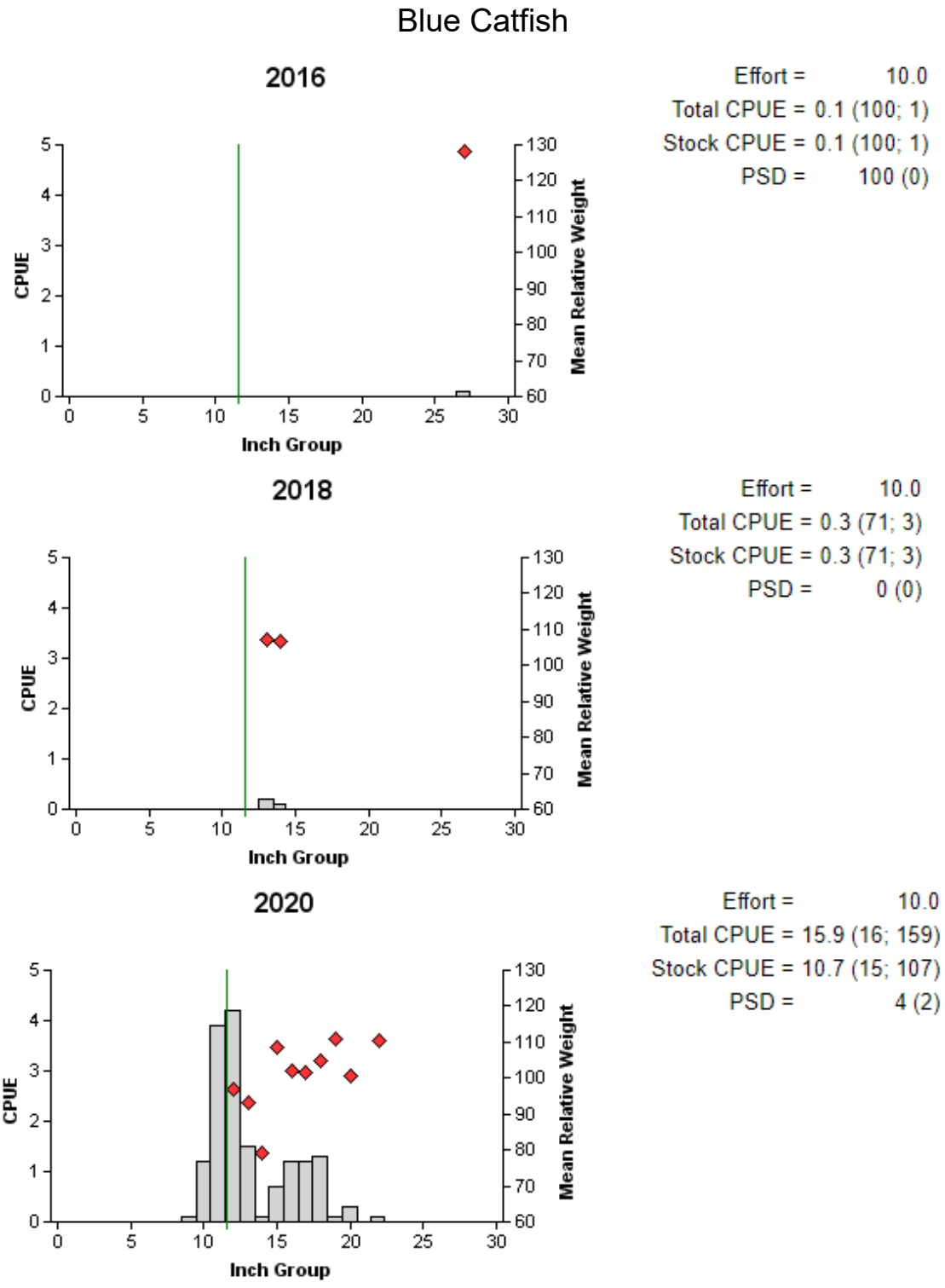


Figure 4. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, E.V. Spence Reservoir, Texas, 2016, 2018, and 2020. Vertical line indicates minimum length limit.

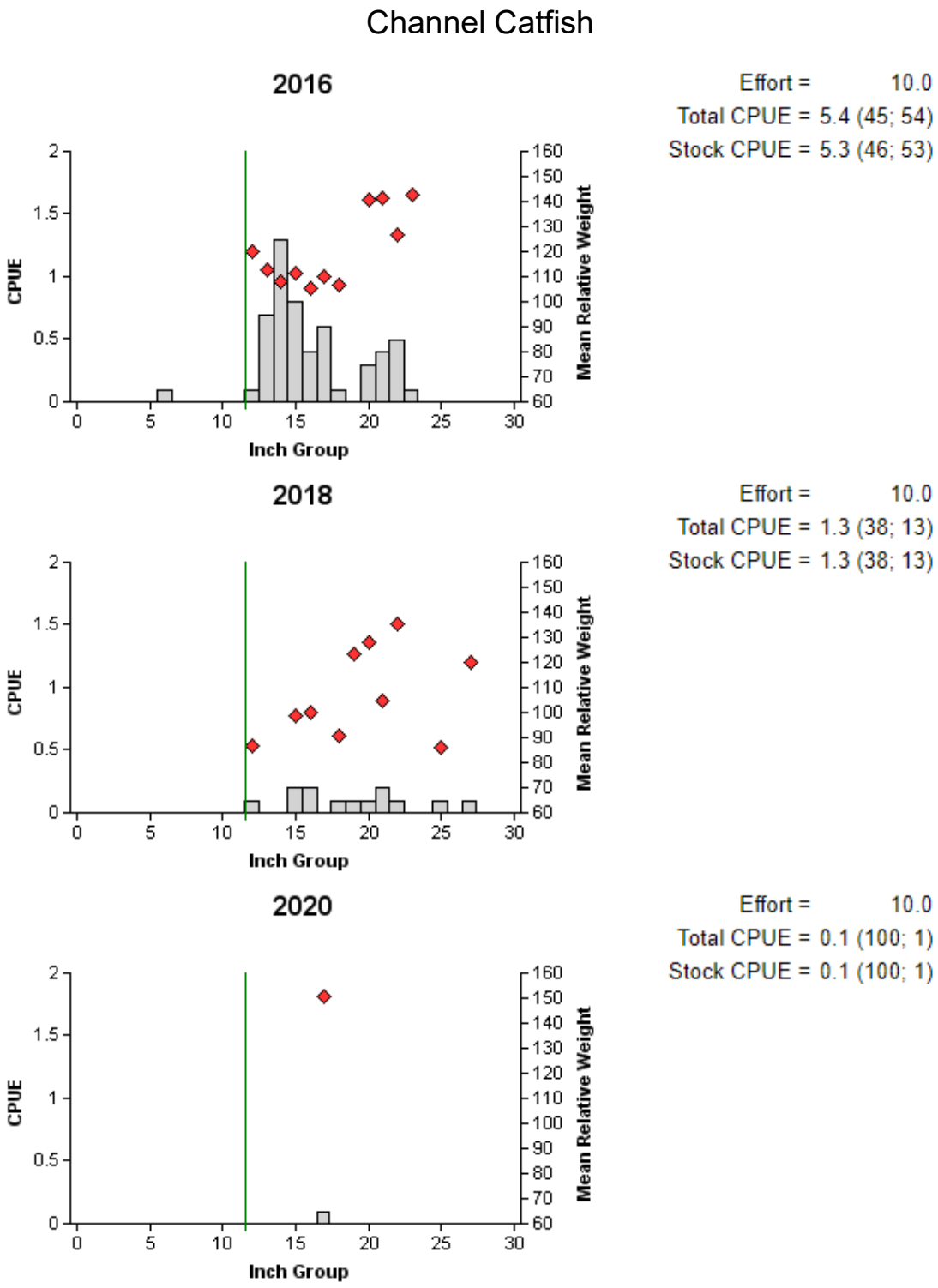


Figure 5. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, E.V. Spence Reservoir, Texas, 2016, 2018, and 2020. Vertical line indicates minimum length limit.

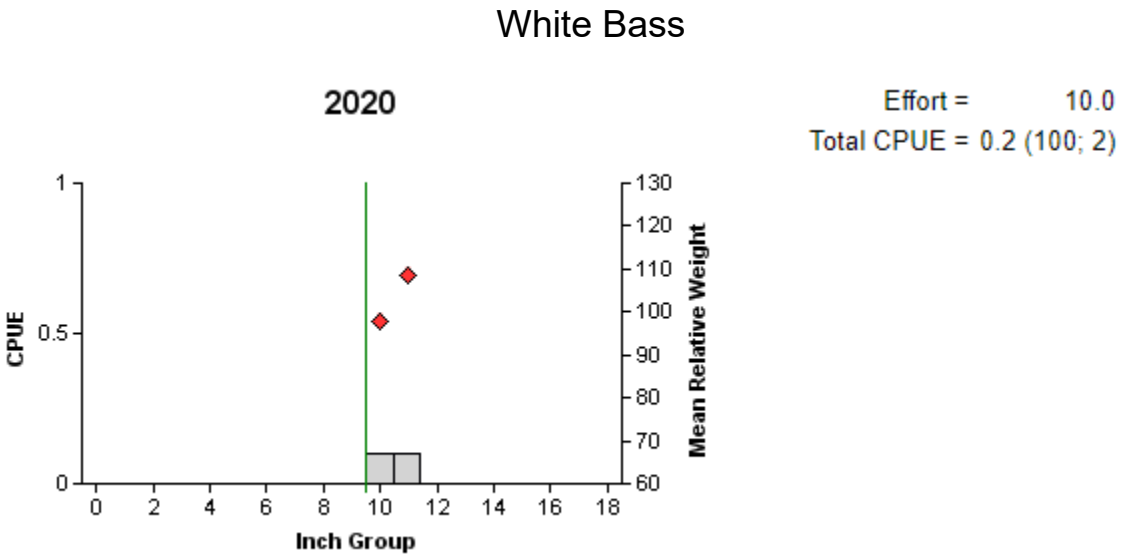


Figure 5. Number of White Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, E.V. Spence Reservoir, Texas, 2020. Vertical line indicates minimum length limit.

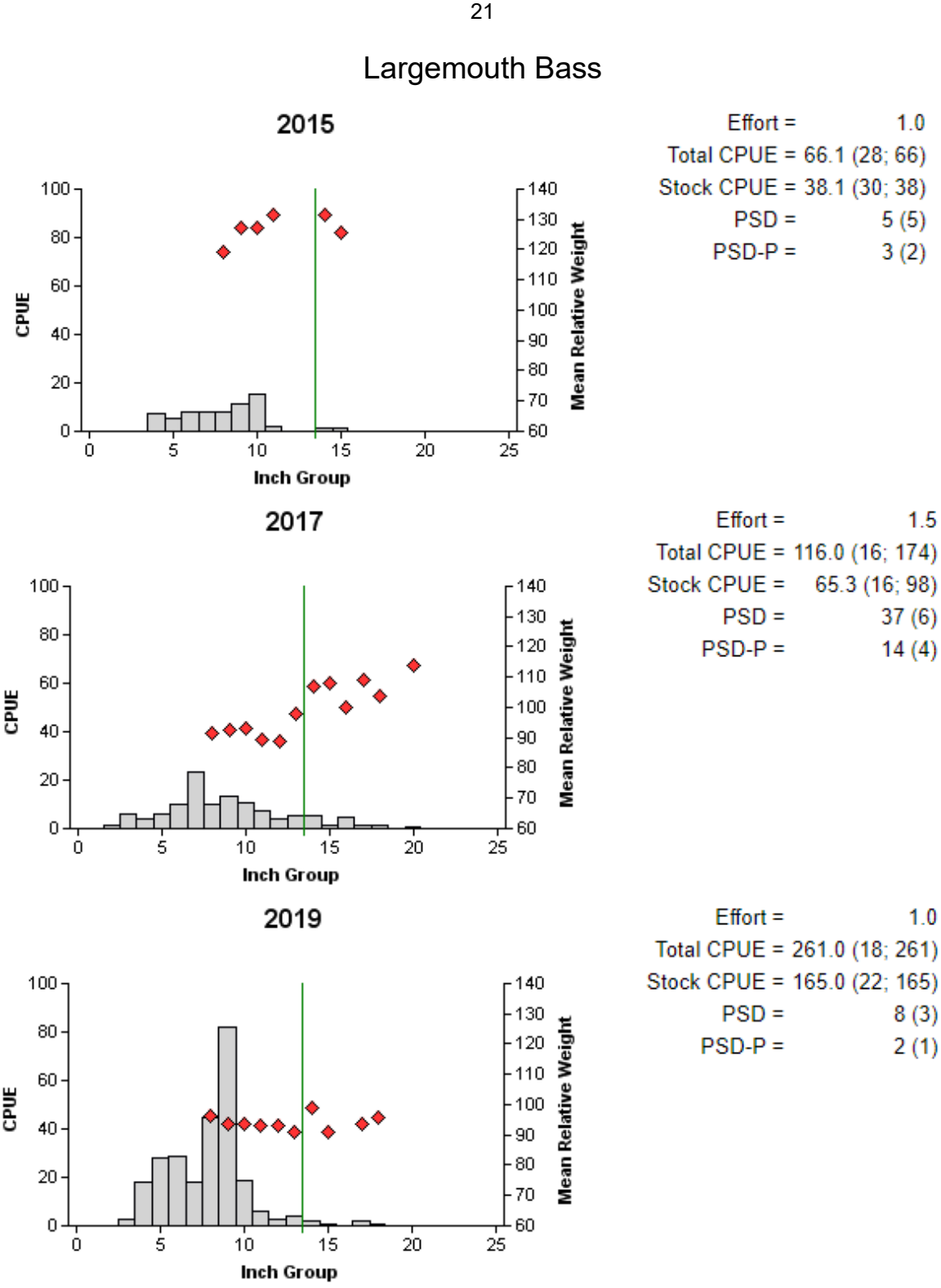


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, E.V. Spence Reservoir, Texas, 2015, 2017, and 2019. Vertical line indicates minimum length limit.

Table 6. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, E.V. Spence Reservoir, Texas, 1993, 1997, 1999, and 2019. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
1993	30	2	26	2	55.0	6.7
1997	29	8	21	0	75.0	27.6
1999	10	4	6	0	73.0	40.0
2019	30	21	9	0	94.0	70.0

White Crappie

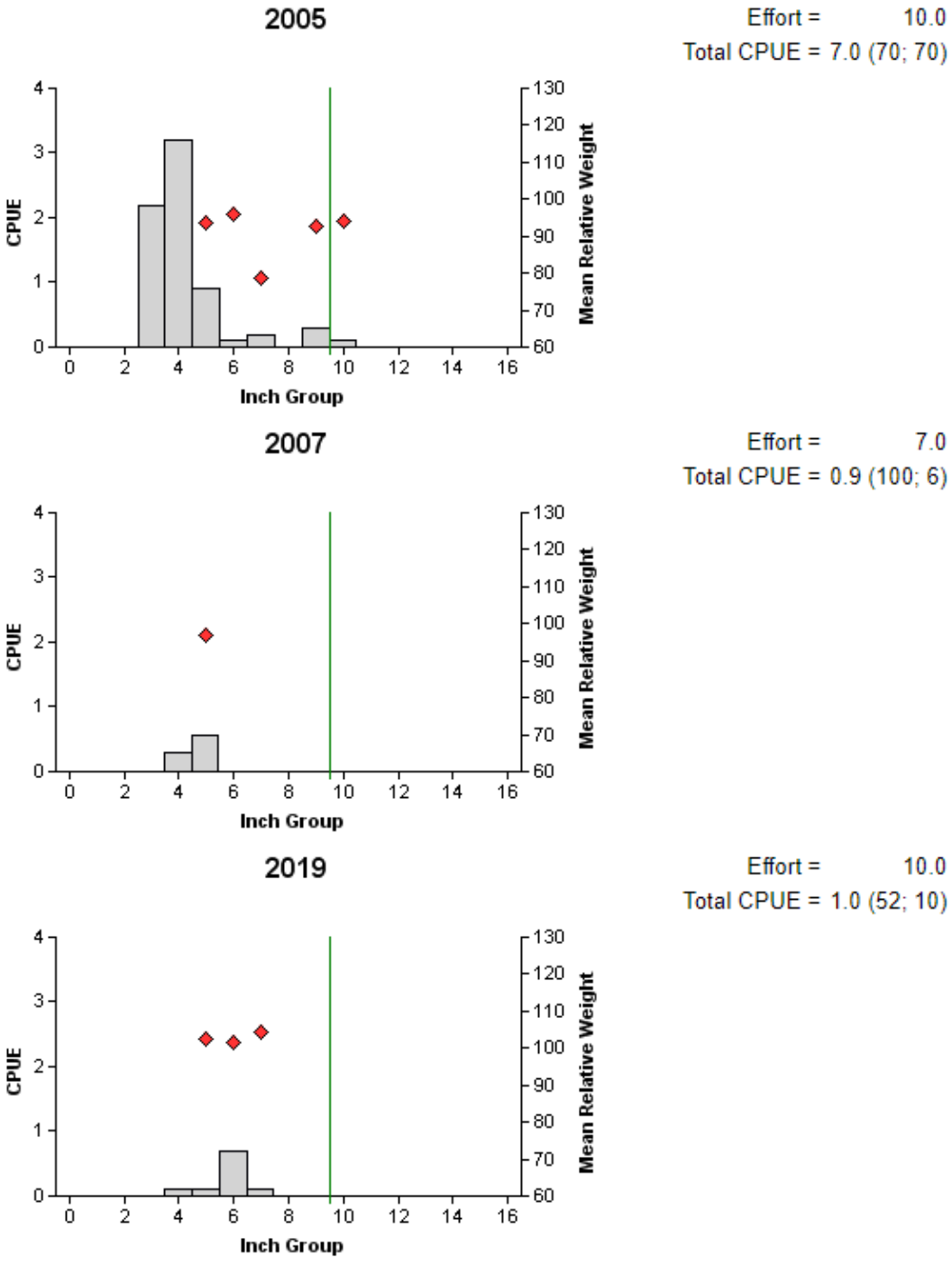


Figure 8. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, E.V. Spence Reservoir, Texas, 2005, 2007, and 2019. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for E.V. Spence 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.

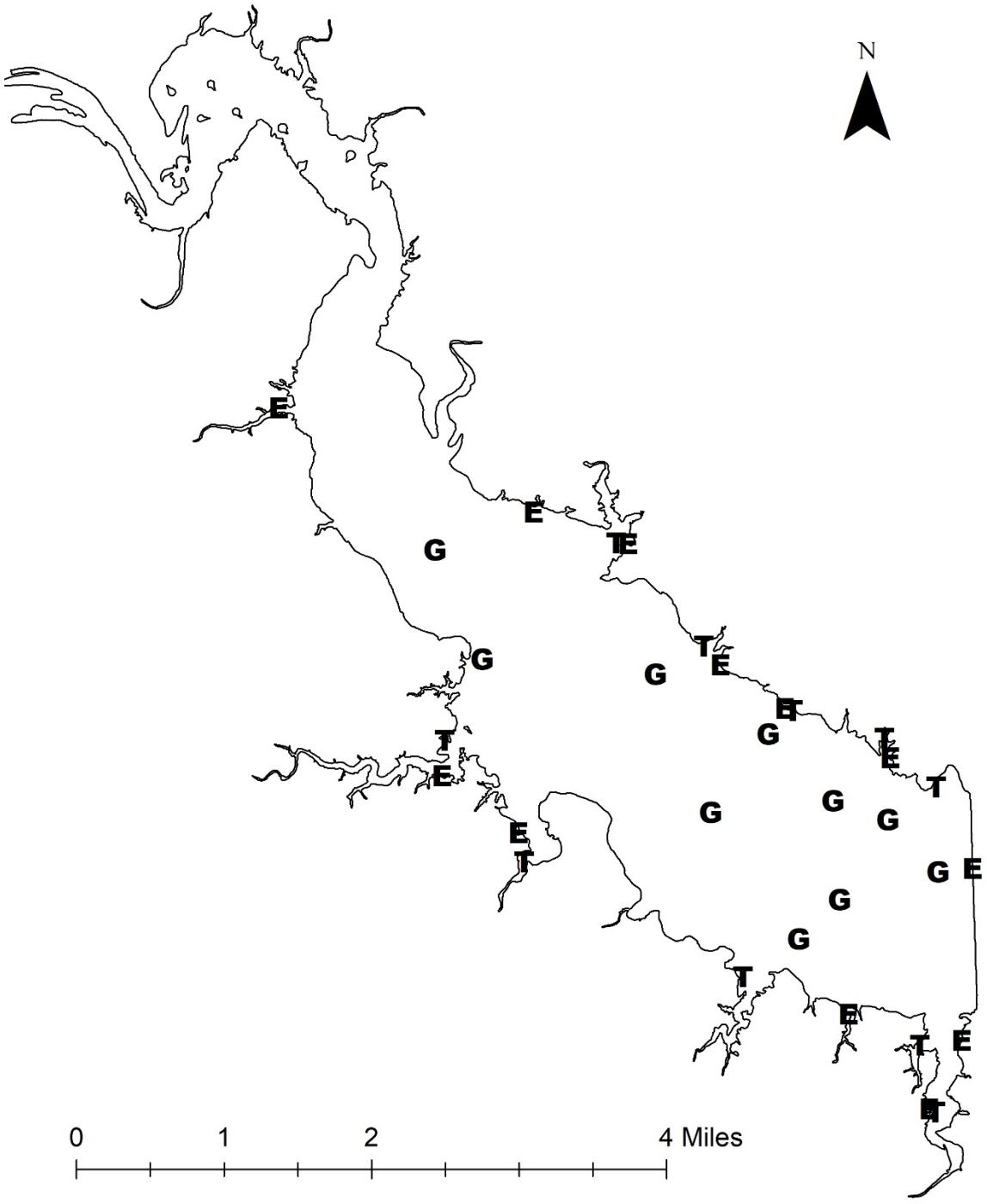
	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Structural Habitat				
Vegetation				S
Electrofishing – Fall		A		S
Trap netting		A		S
Gill netting		A		S
Creel survey	A			
Report				S

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from E.V. Spence Reservoir, Texas, 2019-2020. Sampling effort was 10 net nights for gill netting, 10 net nights for trap netting, and 1 hour for electrofishing.

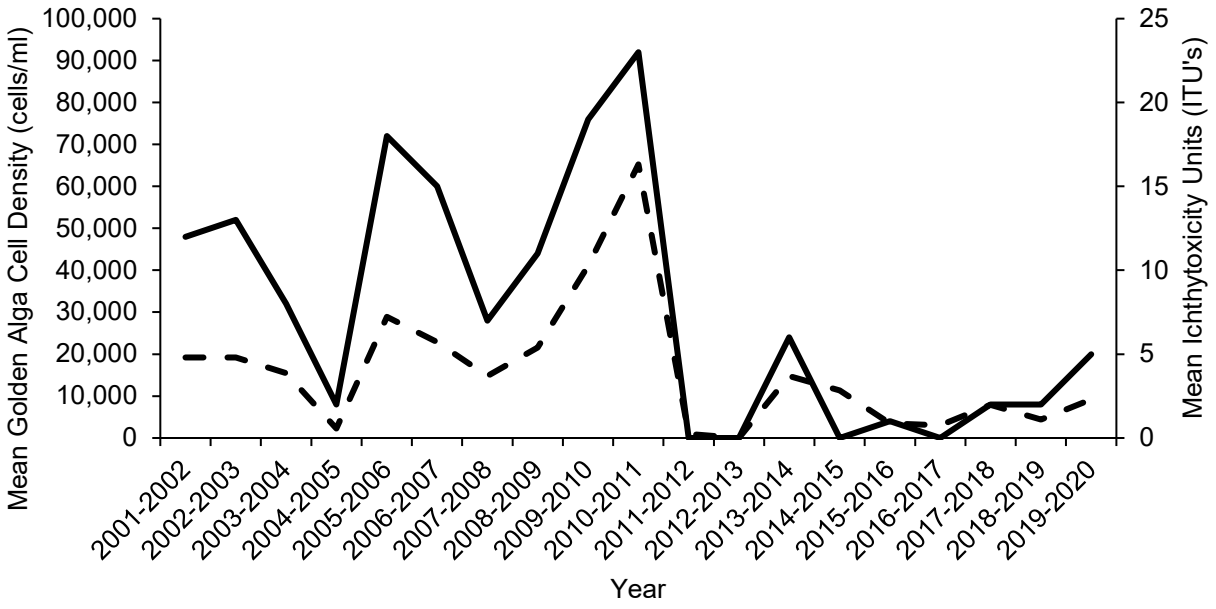
Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					278	278.0 (33)
Blue Catfish	159	15.9 (16)				
Channel Catfish	1	0.1 (100)				
White Bass	2	0.2 (100)				
Green Sunfish					17	17.0 (35)
Bluegill					45	45.0 (26)
Longear Sunfish					1	1.0 (100)
Largemouth Bass					261	261.0 (18)
White Crappie			10	1.0 (52)		

APPENDIX B – Map of sampling locations



Location of sampling sites, E. V. Spence Reservoir, Texas, 2019-2020. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was approximately 36 feet below conservation pool at time of sampling.

APPENDIX C – Mean golden alga cell counts and toxicity



Mean winter golden alga cell densities (cells/ml – dashed line) and ichthyotoxicity units (ITU's – solid line) for E. V. Spence Reservoir from 2001 to 2020. Mean cell densities were calculated from samples taken from October through June when golden alga typically occurs. Mean ITU's were calculated from the duration of each golden alga bloom.

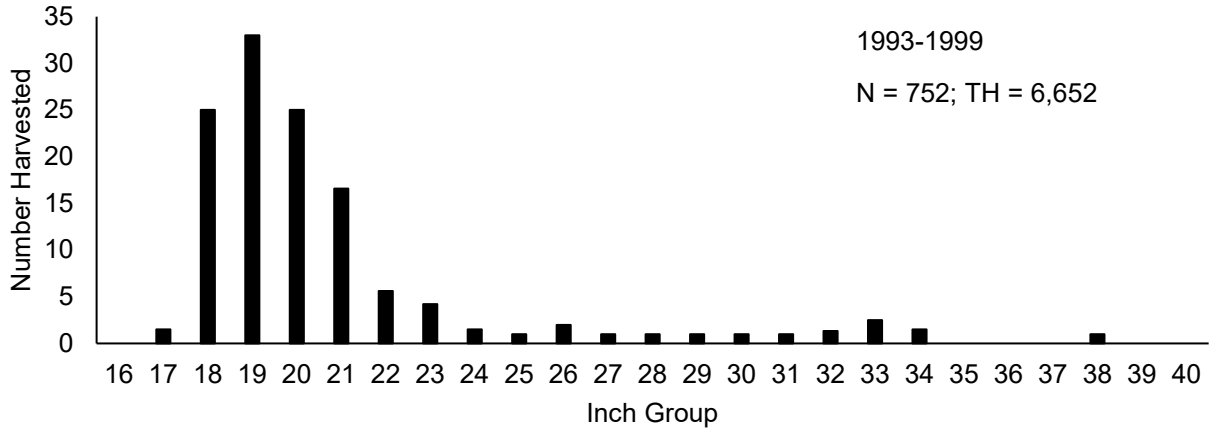
APPENDIX D – Historical Striped Bass creel data 1989-1999

Creel survey statistics for Striped Bass at E. V. Spence Reservoir, Texas, from December 1989 through November 1999. Angler effort is defined as hours fished.

Metric	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	***Mean***
Surface Acres	7,774	6,895	6,526	8,460	8,257	7,670	7,357	6,026	6,026	4,814	3,990	***6,709***
Effort Acre	4.66	12.12	5.45	6.82	5.61	7.5	6.9	6.2	3.6	3.29	4.39	***6.05***
Catch Acre	0.27	0.52	0.52	0.57	0.4	0.7	0.76	0.57	0.27	0.8	0.222	***0.51***
Harvest Acre	0.13	0.18	0.07	0.05	0.12	0.36	0.13	0.09	0.02	0.15	0.14	***0.13***
Total Effort	36,227	83,567	35,567	57,697	46,322	57,525	50,763	37,361	21,694	15,838	17,516	***40,589***
Total Harvest	1,011	1,241	457	423	991	2,761	956	542	121	722	559	***889***

Percent directed angler effort by species for E. V. Spence Reservoir, Texas, 1989–1999. Survey periods were from 1 December through 30 November.

Species	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	***Mean***
Striped Bass	28%	54%	50%	76%	53%	60%	59%	52%	61%	45%	57%	***54%***
Largemouth Bass	37%	32%	33%	19%	28%	37%	30%	28%	14%	31%	10%	***27%***
White Bass	20%	3%	2%	2%	2%	1%	5%	10%	20%	21%	30%	***11%***
Catfish Species	7%	9%	13%	2%	9%	2%	4%	10%	6%	2%	3%	***6%***
White Crappie	8%	3%	2%	1%	7%	0%	2%	1%	0%	1%	0%	***2%***



Length frequency of harvested Striped Bass observed during creel surveys at E. V. Spence Reservoir, Texas, December 1993 through November 1999, all anglers combined. N is the number of harvested Striped Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

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