Fort Phantom Hill 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

Prepared by:

Michael D. Homer Jr., District Management Supervisor
and
Natalie Goldstrohm, Assistant District Management Supervisor

Inland Fisheries Division
Abilene District, Abilene, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

July 31, 2020

Contents

Survey and Management Summary

Fish populations were surveyed in fall 2017 and fall 2019 with electrofishing and trap netting in 2016-2018 and by low frequency electrofishing in summer 2017. Historical data are presented with the 2016-2020 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: Fort Phantom Hill Reservoir is a 4,246-acre impoundment constructed on Elm Creek about 15 miles north of Abilene, Texas. It is located in the Brazos River Basin and is primarily used for municipal water supply and recreation. The power plant was closed in 2012. Installation of a breakwater structure was completed in 2012 to reduce wave-action at the main boat ramp, and extension of the boat dock and two boat-ramp lanes was completed in 2012. In 2014, an effluent water discharge system was installed on the central eastern side of the reservoir for water reuse. Water level increased to over conservation pool multiple times during 2016 and 2017. In 2018, water level dropped nearly five feet, but fall 2018 rains and consistent rains in 2019 and winter 2020 kept it to nearly full pool by spring 2020.

Management History: Important sport fish include White Crappie, Hybrid Striped Bass, Largemouth Bass, and catfishes. White Bass are also present and are often targeted with Hybrid Striped Bass. Walleye were stocked 10 times from 1973 to 1995 before requests were discontinued because of poor recruitment and failure to establish a popular fishery. Blue Catfish were introduced in 1974. An 18-inch minimum length limit on Blue Catfish existed from 1993 to 1999 before reverting to the statewide regulation. Threadfin Shad were introduced in 1984. Florida Largemouth Bass were introduced in 1976 and have been stocked 11 times from 1976 to 2017. A 16-inch minimum length limit on Largemouth Bass, in effect from 1994 to 2012, was changed to the statewide 14-inch minimum length limit on September 1, 2012. Since 1977, Palmetto Bass were stocked nearly annually until 2014. Sunshine Bass were introduced in 2014. Palmetto Bass were also stocked in 2014. Sunshine Bass were stocked again in 2015 and 2016, whereas both hybrid types were stocked from 2017-2019.

Fish Community

- **Creel:** During the March 2016 – February 2017 roving creel survey, anglers spent approximately 79,164 h fishing at Ft. Phantom Hill Reservoir, and they had about $1,369,604 in expenditures. Anglers reported spending the greatest amount of effort targeting catfishes, anything, White Crappie, and Hybrid Striped Bass.
- **Prey Species:** Gizzard Shad were numerous throughout the survey period and continued to be the dominant prey species. Bluegill, Longear Sunfish, and Inland Silversides were also relatively abundant and support the prey species community.
- **Catfishes:** Blue Catfish were relatively abundant in gill netting surveys. However, most individuals were of sub-legal length. Channel Catfish continued to have low relative abundance in gill netting surveys. Flathead Catfish had fair catch rates in the summer 2017 low-frequency electrofishing survey.
- **Temperate Basses:** White Bass relative abundance fluctuated from 2016-2018, and mostly legal fish were observed in the samples. Hybrid Striped Bass were relatively abundant in the reservoir, but their catch rates fluctuated since the last survey period. Many legal fish were Palmetto Bass in the 2016-2018 gill netting surveys. Sunshine Bass stocked in 2014-2017 were sampled with increasing relative abundance during the 2016-2018 gill netting surveys. Some Sunshine Bass in the 2017 and 2018 gill netting surveys had achieved legal length within two years of age.
- **Largemouth Bass:** Largemouth Bass relative abundance in electrofishing surveys was variable during the survey period but catch rates of legal fish increased from 2017-2019.
- **White Crappie:** White Crappie catch rate in trap net surveys decreased over the survey period. Crappie production appeared correlated with water level fluctuations. Less legal length fish were observed in the 2019 trap netting survey compared to prior surveys.

Management Strategies: Continue to stock Hybrid Striped Bass and evaluate growth between Palmetto and Sunshine Bass. Work with City of Abilene to improve angler access. Continue biennial trap netting surveys to monitor trends of White Crappie relative abundance. Educate public about invasive species threats.

Introduction

This document is a summary of fisheries data collected from Fort Phantom Hill Reservoir during 2016-2020. 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 species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Management strategies are included to address existing problems and/or opportunities. Historical data are presented with the 2016-2020 data for comparison.

Reservoir Description

Fort Phantom Hill Reservoir is a 4,246-acre impoundment constructed on Elm Creek, approximately 15 miles north of Abilene, Texas. The reservoir is located in the Brazos River Basin and is controlled by City of Abilene for municipal water supply and recreation uses. Water level substantially fluctuated from 2007 to 2015 (Figure 1). Water level increased to over conservation pool multiple times during 2016 and 2017. In 2018, water level dropped nearly five feet, but fall 2018 rains and consistent rains in 2019 and winter 2020 kept it to nearly full pool by spring 2020. Other descriptive characteristics for Fort Phantom Hill Reservoir are in Table 1.

Angler Access

Fort Phantom Hill Reservoir has six public boat ramps. From spring 2016 to late spring 2020, all public ramps were accessible. Installation of a breakwater structure was completed in 2012 to reduce wave action at the main boat ramp. Two lanes at the main ramp were also extended to allow for better access during periods of low water level. Additional boat ramp characteristics are displayed in

Table 2. Bank fishing access was plentiful in various areas throughout the reservoir, but bank access was better during periods of low water level. One privately-operated pay-for-fishing dock and one public fishing dock were available. A kayak launch was purchased with largemouth conservation license plate funds and additional funding from City of Abilene, and it was installed during 2018 at the main boat ramp.

Management History

Management strategies and actions from the previous survey report (Homer and Goldstrohm 2016) included:

1. Continue to stock both Palmetto and Sunshine Bass fingerlings equally and annually at 15/acre. Conduct a study to evaluate growth, gear susceptibility, and angler catch between Palmetto and Sunshine Bass. Conduct a creel survey to assess angler-directed effort and harvest of Hybrid Striped Bass.

   Actions: Only Sunshine Bass were stocked during 2015 and 2016 because of poor production of Palmetto Bass fingerlings. Both Hybrid types were stocked about equally from 2017-2018 at 7/acre (14/acre total), though the stocking rate in 2019 for both hybrid types had to be reduced to 4/acre each because of poor fingerling production. Stocking of Sunshine Bass fry occurred in 2020. A roving creel was conducted from March 1, 2016 – February 28, 2017.

2. Meet with City of Abilene to discuss access point closures, as well as discuss needed repairs to the fishing pier and main boat ramp dock and identify potential bank angler access improvement strategies such as funding through a boater access grant.

   Action: Multiple discussions with City of Abilene were had regarding needed improvements to access and closures. City of Abilene replaced the main boat dock in 2017, and a kayak launch was purchased in 2018 in collaboration with TPWD with conservation license plate funding. In 2019, City of Abilene replaced the fishing pier at Johnson Park. Other area access closures by City of Abilene have taken place to prevent the development of social trails, reduce littering, and prevent illegal activities.

3. Meet with City of Abilene and TPWD invasive species experts to discuss salt cedar expansion around the reservoir, potential problems, possible monitoring efforts, as well as prospective

measures for control.

Action: Multiple discussions with City of Abilene were had about salt cedar establishment and potential detriments. No actions by the City of Abilene were taken during the survey period because salt cedar coverage was reduced during periods of high-water level and inundation.

4. Cooperate with the controlling authority to post appropriate invasive species signage at access points throughout the reservoir. Educate the public about invasive species using social and other media. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) all existing and future inter-basin water transfer routes to facilitate potential invasive species responses.

   Action: Invasive species signage was maintained at all Ft. Phantom Hill Reservoir public boat ramps. District biologists have made a speaking point about invasive species over the past several years and included. Inter-basin water transfers will be updated as needed.

Harvest regulation history: From September 1, 1993 to August 31, 1999, Blue Catfish were managed with an 18-inch minimum length limit (MLL). However, the regulation reverted to the statewide 12-inch MLL because of low angler support and extremely slow growth of Blue Catfish. Largemouth Bass harvest was regulated with a 16-inch MLL from September 1, 1994 to August 31, 2012, and the population has since been managed by the statewide 14-inch MLL. Other sport fishes have been managed with statewide regulations (Table 3).

Stocking history: Walleye fry were stocked 10 times from 1973-1995. Blue Catfish fingerlings were introduced in 1974. Redear Sunfish fingerlings were introduced in 1981. Adult Threadfin Shad were introduced in 1984. Florida Largemouth Bass were introduced in 1976 and were stocked eight times from 1976-2001 and again in 2014 as well as 2016-2017. Palmetto Bass were introduced in 1977 and were stocked nearly every year until 2014. In 2014, as well as during 2017-2019, both Sunshine Bass and Palmetto Bass fingerlings were stocked; only Sunshine Bass fingerlings were stocked in 2015 and 2016. Sunshine Bass fry were stocked during 2020. The complete stocking history is displayed in Table 4.

Water transfer: A single, permanent pumping station exists at the reservoir which transfers water from the Clear Fork of the Brazos River to the reservoir during periods of high stream flows. Water can also be transferred from Hubbard Creek Reservoir near Breckenridge, Stephens County, Texas. An effluent water discharge was constructed near the southeast boat ramp to divert treated wastewater to the reservoir from the Hamby Wastewater Treatment Plant, and it became fully operational in 2015. No interbasin transfers are known to exist.

Methods

Surveys were conducted in accordance with the objective-based sampling (OBS) plan for Fort Phantom Hill Reservoir (Homer and Goldstrohm 2016). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and 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 night-time electrofishing (2 hours at 24, 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 13.0 to 14.9 inches were determined by using otoliths from 14 randomly selected fish in 2017 and three in 2019.

Low-frequency electrofishing was conducted during late summer 2017 (1 hour at 20, 3-min stations) to collect Flathead Catfish. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Trap netting – White and Black 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). Additional fish were

collected by experimental gill nets and were used for age estimation. Ages for White Crappie 9.0 to 10.9 inches were estimated by using otoliths collected from 13 randomly selected fish collected during 2017 and 16 fish collected during the fall 2019 survey; mean age at at legal length was calculated separately for each sample.

Gill netting – White Bass, Hybrid Striped Bass, Blue Catfish, and Channel Catfish were collected by gill netting (15 net nights at 15 stations). White Crappie 9.0-10.9 inches TL kept for assessing age at legal length during 2018. CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for 13 randomly collected White Bass 9.0-10.9 inches were used for age estimation. Ages for Hybrid Striped Bass were determined by using otoliths from all hybrids sampled during the 2016-2018 gill netting surveys, and mean length at age was determined for each cohort represented in the samples.

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 through 2019 and by electrophoresis for previous years. Fin clips were collected from each Hybrid Striped Bass during gill netting and were sent to TPWD Inland Fisheries – A.E. Wood Laboratory for genetic analysis for determination of hybrid type. Following DNA isolation, each tissue sample will be evaluated by using the reaction MPX1-Morone (Msa5-11 and Msa5-71) to verify the hybrid status of each fish (Dijar Lutz-Carrillo, personal communication). Each fish will be evaluated with a single base extension (SBE-Morone) assay using Cytochrome Oxidase Subunit-1 as a substrate to amplify single nucleotide polymorphisms (SNPs) at three sites, which this will allow for the resolution of species-specific SNPs which identified the maternal contributor to the hybrid.

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 (Wr)] 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 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Habitat – A structural habitat and vegetation survey were conducted in summer 2019 by using the random point method (TPWD, Inland Fisheries Division, unpublished manual revised 2017). Habitat features and vegetation were surveyed at 274 random points throughout the reservoir. Shoreline vegetation structural habitat features were surveyed at 141 of the random stations and were analyzed separately. Plants and structural habitat types were identified at or below the waterline and marked as “1” for present or “0” for absent. Percent occurrence (% = [# stations present / total stations sampled] X 100) and associated 95% confidence intervals were calculated (Ausvet 2020) for native and exotic plant species and structural habitat types.

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

Results and Discussion

Habitat: Habitat stations surveyed during summer 2019 were mostly open water and featureless (Table 6). Shoreline habitat consisted mostly of natural shoreline as well as there were sections with rocks, gravel, boat docks, and bulkhead (Table 7). Though, habitat features identified in other locations were primarily flooded terrestrial vegetation, buttonbush, and water stargrass. Exotic salt cedar was present but with sparse coverage.

Creel: During the March 2016 – February 2017 roving creel survey, anglers spent an estimated 79,164 h fishing at Fort Phantom Hill Reservoir, and they had about $1,369,604 in expenditures. About 60.2% of the reported fishing effort was from bank anglers and the remaining 39.8% of effort was reported from boat anglers. Approximately 36.2% of all angling effort was directed towards catfishes, primarily Blue Catfish, whereas anglers also reported targeting anything (27.3%), White Crappie (18.5%), Hybrid Striped Bass (10.2%), and Black Bass (5.8% allocated effort) differed among bank and boat anglers. Most popular species targeted by bank anglers were catfishes (50.3%), catching anything (28.0%), White Crappie (11.5%), and Hybrid Striped Bass (5.3%). Most popular species sought after by boat anglers were White

Crappie (28.9%), catching anything (26.3%), Hybrid Striped Bass (17.6%), catfishes (15.1%), and Largemouth Bass (11.8%). Anglers reported catching about 0.5 fish/h, which approximately 0.1 fish/h were harvested, and 0.3 fish/h were released. Overall, an estimated 35,446 fish were caught, which 27,017 fish were released and the remaining 8,429 were estimated to be harvested. Boat anglers were more successful in catching a fish (0.8 fish/h) in comparison to bank anglers (0.2 fish/h).

Prey Species: Gizzard Shad catch rates declined from 877.0/h in 2015 to 171.5/h in fall 2019 (Figure 2). The IOV for Gizzard Shad also declined during the same period from 92 to 60, though most fish in the 2019 survey were still adequate prey sizes for sport fish. Bluegill total catch rates fluctuated from 211.5/h in 2015 to 309.9/h in 2017, and to 266.0/h in 2019 (Figure 3). Similarly, catch rates of stock length Bluegill fluctuated. Bluegill PSD remained low and slightly increased from 1 in 2015 to 8 in 2019, which suggested that the size structure of the population was dominated by sub-stock fish. Longear Sunfish were also common, and their catch rates declined from 146.0/h in 2015 to 53.5/h in 2019 (Figure 4). Inland Silversides were also numerous in the surveys, but they could not be adequately sampled by standard sampling gear. Prey catch trends have fluctuated over the years but have recently declined (Figure 5). This decline may be a result of poor sampling because of malfunctioning equipment, but prey do not appear to be a limiting factor for the success of existing fisheries.

Catfishes: Blue Catfish total catch rates in spring gill netting surveys has increased since 2016 from 6.5/nn to 23.2/nn in 2018 (Figure 6). Similarly, catch of legal length fish increased slightly from 4.5/nn in 2016 to 7.5/nn in 2018. The PSDs for Blue Catfish fluctuated slightly from 9 in 2016 to 7 in 2017 and to 13 in 2018. Channel Catfish and Flathead Catfish are also present in the reservoir but are considered low-density species. Flathead Catfish were sampled at a rate of 25.0/h in a late summer low-frequency electrofishing survey, and fish ranged from 6-20 inches TL (Figure 7). In the March 2016-February 2017 creel survey, anglers reported 28,691 h targeting catfishes at the reservoir (Figure 9). Compared to the March-August 2007 creel survey, the March-August 2016 creel period of the yearlong survey had over 9,500 more hours of directed angling effort towards catfishes. Blue Catfish were the most documented of the catfishes harvested by anglers documented in both the 2007 and 2016 creel surveys. An estimated 2,736 Blue Catfish, 271 Channel Catfish, and no Flathead Catfish were harvested during the March 2016-February 2017 creel period. Most of the harvests were documented during the March-August 2016 period; however, harvests were lower than 2007 survey creel. Gill netting total catch rate in 2016 was slightly less (6.5/nn) than the reported rate in 2008 (9.3/nn; Dumont 2012). However, catch rate of legal fish was slightly higher in 2016 than reported in 2008, which the data suggested that the availability of legal individuals may have not been an issue in the reduction of harvests observed in the 2016-2017 creel survey. do. In the March 2016-February 2017 creel, 69 Blue Catfish were observed as harvested, which a majority of these observations occurred during the March-August 2016 period (Figure 8). A total of 13 Channel Catfish were harvested in the March 2016-February 2017 creel survey; 6 of these fish occurred during the March-August 2016 time period, which was 21 fish less than reported in 2007 (Figure 9).

White Bass: White Bass catch rates in the spring gill netting surveys were low and slightly fluctuated from 1.5/nn in 2016 to 3.0/nn in 2017 to 1.1/nn in 2018; most of these fish were of legal lengths (Figure 10). Anglers only reported 103 hours estimated angling pressure targeting White Bass during the March 2016-February 2017 creel survey, and an estimated 86 White Bass were harvested during the March-August 2016 period; harvest is substantially less than reported in 2007 (n=3,837). During the 2016-2017 creel survey, only four fish were observed harvested and were 12-13 inches TL. While reported angling effort may be low specifically for White Bass, these fish do support the existing Temperate Bass fishery in combination with stocked Hybrid Striped Bass; anglers reported targeting Temperate Bass for an estimated 8,194 h in the recent 2016-2017 creel.

Hybrid Striped Bass: Historically, Palmetto Bass stockings supported the fishery. Sunshine Bass have been stocked annually since 2014 and in combination with Palmetto Bass except during 2015, 2016, and 2020. Stocking rates were nearly equal for the combination stockings except during 2018, which approximately 60% of the fingerlings stocked were Palmetto Bass. Hybrid Striped Bass catch rates fluctuated from 4.9/nn in 2016 to 12.0/nn in 2017 to 7.7/nn in 2018 (Figure 11). Fluctuations in total catch rates are smaller than those observed in prior surveys for Palmetto Bass conducted during 2008-2014 (Total CPUE range = 6.6-23.1/h; Dumont 2012). Similarly, catch rates of legal length fish fluctuated from 2.2/nn in 2016 to 8.3/nn in 2017 and 6.9/nn in 2018. The PSDs increased from 80 in 2016 to 98 in both

2017 and 2018; the PSD's indicated that a majority of the samples were comprised of fish greater than stock length. Mean relative weights for most represented inch groups in the samples collected from 2016-2018 were fair to good (most being W_r>90). Most Palmetto and Sunshine Bass sampled in the 2016-2018 surveys appeared to achieve legal length (i.e., 18 inches) in about 3 years, though some individuals from the 2015 and 2016 Sunshine Bass stockings had attained it in about 2 years. Anglers reported 8,091/h of directed fishing effort targeting Hybrid Striped Bass during the March 2016-February 2017 creel survey (Table 10). Most of the reported angling effort occurred during the March-August 2016 period (5,810 h), and the estimate was lower than that reported in 2007 (6,776 h) for the same period. In the March-August 2016 period, 666 hybrids were estimated harvested, whereas much more were estimated harvested in the 2007 creel (2,474 fish; Figure 12).

Largemouth Bass: Since 2015, catch rates of Largemouth Bass have fluctuated from 78.5/h in 2015 to 59.3/h in 2017 to 74.5/h in 2019 (Figure 13). Catch rates of stock length and legal Largemouth Bass both increased from 2015 to 2019. The PSDs increased from 19 in 2015 to 69 in 2017 and dropped to 56 in 2019. Since 2015, there was more representation of fish greater than stock length in the 2017 and 2019 surveys, which may have been a result of sampling and/or lower reproduction by Largemouth Bass. Mean relative weights in each survey were optimal (i.e.,W_r ≥90) for the represented inch groups. Mean age at legal length was approximately 2.0 years old for fish collected in fall 2017 (Figure 14). Florida Largemouth Bass (FLMB) genetic influence has been variable, which prevalence of FLMB alleles ranged from 41.4-61.9%, and prevalence of pure FLMB in samples ranged from 2.8-9.7. In the March 2016-February 2017 creel survey (Table 11), anglers spent an estimated 4,606 h of effort targeting Largemouth Bass (Table 12). In comparison to the March-August 2007 survey, the estimated effort in the same period of 2016 was 3,248 h and was greater than previously reported during 2007 (2,656 h). Anglers reported releasing 87.1% of legal bass during the March 2016-February 2017 creel survey. During the same creel survey, two Largemouth Bass were observed harvested by anglers, and an estimated 29 fish were harvested (Figure 15).

White Crappie: White Crappie catch rates declined from 31.5/nn in 2015 to 7.6/nn in 2019 (Figure 16). Similarly, catch rates of stock length White Crappie declined from 18.0/nn in 2015 to 10.7/nn in 2017 and to 6.6/nn by 2019. Catch rates of legal White Crappie were similar for the three surveys and ranged from 2.1-3.0/nn. Trends in catch of legal fish since 1996 have been variable, but the ratio of legal fish to sublegal fish across samples has been relatively similar (Figure 17). Since 2017, PSDs for the samples increased from 36 to 82, suggesting that size structure had greater relative abundance of fish greater than stock length and that reproduction and recruitment were not as successful as observed in the 2015 and 2017 surveys. Mean relative weights for White Crappie in the three surveys were optimal. Mean age at legal length was approximately 1.9 for the fish collected in 2017 and 3.1 years for the White Crappie sampled in the 2019 trap netting survey (Figure 18). White Crappie supported the second-most popular fishery in the 2016-2017 creel survey, which anglers spent an estimated 14,610 h of directed fishing effort. This was lower than the 17,561 h reported in the May-August 2007 creel survey (Table 13; Figure 19) Estimated harvest of White Crappie was substantially less in the 2016-2017 creel than what was estimated for the 2007 creel; the decline might be attributed to poor angling success and dispersal of fish following the increase in water level and habitat availability from rainfall in 2015 and 2016.

Fisheries Management Plan for Fort Phantom Hill Reservoir, Texas

Prepared – July 2020

ISSUE 1: Hybrid Striped Bass have provided a popular fishery at Fort Phantom Hill Reservoir since 1977. Annual stockings of Hybrid Striped Bass are necessary to maintain the fishery. Both Palmetto and Sunshine Bass have been stocked to support the Hybrid Striped Bass fishery at Fort Phantom Hill Reservoir.

MANAGEMENT STRATEGIES

1. Continue to annually stock Hybrid Striped Bass at 15 fingerlings/acre.
2. Assess differences in stocking success, recruitment, and relative catchability between Palmetto and Sunshine Bass stocked as fingerlings.

ISSUE 2: White Crappie are the second-most sought-after species at the reservoir, though reproduction as well as trap netting and reported angler catch rates suggest there has been a population decline during the most recent survey period.

MANAGEMENT STRATEGIES

1. Continue biennial trap netting surveys to monitor trends in White Crappie relative abundance.

ISSUE 3: Closure of popular bank fishing access points has occurred periodically by City of Abilene to prevent illegal activities, reduce littering, and to avoid damage to the lake bed.

MANAGEMENT STRATEGIES

1. Meet with City of Abilene Water Utilities Division and the Parks and Recreation Division leadership to discuss the bank access closures and to develop potential strategies to improve accessibility for anglers at the reservoir.
2. Seek potential funding to create and additional kayak ramp or launch at one of the public boat ramps.

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 with 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 fish, forage fish, and other important fishes: Sport fishes in Fort Phantom Hill Reservoir include Blue Catfish, White Bass, Hybrid Striped Bass, Largemouth Bass, and White Crappie. Important forage species include Gizzard Shad, Threadfin Shad, and sunfishes, particularly Bluegill and Longear Sunfish. Inland Silverside are also an important forage species, but they have not been successfully captured with standardized gears used in the monitoring surveys.

Low-Density Fisheries: Channel Catfish are present in the reservoir, but they have been in low relative abundance in gill netting surveys. From 2004-2018, catch of Channel Catfish in gill net surveys ranged from 0.3 fish/nn to 1.8 fish/nn. Sampling for Channel Catfish is unnecessary during 2020-2024. Flathead Catfish are present in the reservoir, but angling effort during the most recent creel surveys in 2016-2017 and March-August 2007 indicated that direct angling effort is low. White Bass are present in the reservoir but have not been relatively abundant in monitoring surveys and anglers have reported low directed effort compared to other existing fisheries during the most recent creel survey conducted in 2016-2017. Both Channel Catfish and White Bass will be monitored for CPUE-Total in conjunction while sampling for Blue Catfish and Hybrid Striped Bass during spring gill netting surveys. No specific sampling objectives will be set for sample sizes and data precision.

Survey objectives, fisheries metrics, and sampling objectives

Prey Species: Sunfishes (i.e., Bluegill and Longear Sunfish), Gizzard Shad, Threadfin Shad, and Inland Silversides are the primary prey species at Fort Phantom Hill Reservoir. Monitoring surveys have traditionally been conducted every four years for prey species. The next electrofishing survey will be conducted in fall 2023 at 18, 5-minute randomly selected stations. Trend data for CPUE and size structure (PSD for sunfishes and IOV for Gizzard Shad) will be collected during the survey. During sampling, target precision of RSE ≤ 25% will be attempted for CPUE-Total for Gizzard Shad and Bluegill. Index of Vulnerability will be calculated for a minimum sample of 50 Gizzard Shad to assess the relative proportion of individuals in the population that are of suitable prey sizes for sport fish. Size structure will be evaluated by determining PSD for Bluegill with a minimum sample of 50 fish. No additional sampling effort will be expended to improve population parameter estimates for prey species. Instead, Largemouth Bass relative weights can provide information on forage abundance, vulnerability, or both relative to predator relative abundance.

Blue Catfish: Catfishes support the most popular fishery at the reservoir, and Blue Catfish are the most abundant. Historical monitoring of Blue Catfish has been achieved with both spring gill netting or low-frequency electrofishing. While low-frequency electrofishing has produced greater sample sizes, catch rates and PSDs have been variable. Monitoring during the 2020-2024 monitoring period with be achieved with spring gill netting. Continuation of monitoring trends in relative abundance is necessary to inform anglers of the status of the fishery as well as to assess changes in relative abundance, size structure, and body conditions. Additional sampling is necessary to assess growth of individuals in the population to better inform management decisions. Gill netting will be conducted once during the sample period by sampling randomly selected stations, likely during 2022-2023 (Table 15). A sample of ≥10 fish per inch group will be collected to assess growth of blue catfish. Size structure (PSD), and ≥5 fish per inch group ≥stock length will be measured for length and weight to assess body condition (as relative weight). If objectives are not met, additional sampling may be conducted if deemed feasible.

Hybrid Striped Bass: Hybrid Striped Bass are a popular fishery in Fort Phantom Hill Reservoir, and frequent stockings have been necessary to maintain the fishery at the reservoir. Palmetto Bass have been stocked frequently since 1977, with the longest periods without stockings occurring between 1979-1983 and 1999-2002. The last stocking of solely Palmetto Bass occurred in 2013. In 2014, as well as from 2017-2019 the reservoir received stockings of both Palmetto Bass and Sunshine Bass. Sunshine Bass were also stocked in 2015, 2016, and 2020. Growth between the two hybrid types has not been evaluated at Fort Phantom Hill Reservoir, and sampling for this species will be conducted as part of a special project to assess growth, recruitment, and relative catchability between Palmetto Bass and Sunshine Bass stocked as fingerlings. Gill netting surveys will be conducted in late winter/early spring 2022 (Table 15) to collect data pertaining

to relative abundance, size structure, and growth of Hybrid Striped Bass. A sample of ≥200 fish will be attempted evaluating size structure of the Hybrid Striped Bass population, to evaluate age and growth, and to determine hybrid type with genetic analysis. Sampling will be conducted by following procedures documented in the special project proposal (TPWD, unpublished).

Largemouth Bass: Largemouth Bass are relatively abundant in Fort Phantom Hill Reservoir and support a small fishery. Specifically, angling effort towards Largemouth Bass declined slightly from 8% to 5% of the total angling effort for all species between the 2003 and 2007 creel surveys, respectively. Directed angling effort for Largemouth Bass was similar to prior creel surveys and made up 5.8% of the overall effort in the March 2016-February 2017 creel survey. Largemouth Bass support the fishery, particularly for those anglers that reported targeting "anything" at the reservoir. To monitor Largemouth Bass and their prey, night time electrofishing surveys will be conducted in the fall 2023 to maintain trend data for relative abundance (CPUE-Total, Stock CPUE, and CPUE-14), size structure, body condition, and to assess the prevalence of Florida and Northern Largemouth Bass alleles in the population. Electrofishing will be conducted for 1.5 hours at 18, 5-minute stations. A target for precision of RSE ≤ 25% for relative abundance data of CPUE-Total and Stock CPUE will be attempted. A target of 50 fish ≥ stock length will be sampled to assess size structure (PSD), and ≥ 5 fish per inch group ≥ stock length will be measured for length and weight to assess body condition. No additional sampling will be conducted to meet objectives for Largemouth Bass.

White Crappie: White Crappie support the second-most popular sport fishery in Fort Phantom Hill Reservoir. The popularity of this species among anglers warrants biennial sampling effort to stay current of the status of the fishery and assess trends in population parameters. Anglers have reported catching less crappie in the 2016-2017 creel survey. In comparison to the March-August 2007 creel survey, about 93% less crappie were harvested during the same period in the 2016-2017 creel survey. Substantial reduction in angler harvest may be attributed to the substantial water level increases. Continuation of biennial trap netting to maintain trend data will allow for better communication about the fishery to our constituents and to improve management of White Crappie. Ten (10) trap nets will be deployed at 10 randomly selected stations in fall 2021 and 2023 (Table 15). A target for data precision at RSE ≤ 25 for CPUE-Total and Stock CPUE will be attempted. A target of 50 White Crappie ≥ stock-length will be collected to monitor trends in size structure (i.e., PSD), and five fish ≥ stock length per inch group will be measured and weighed to assess body condition. A sample of 13 fish 9.0-10.9 inches will be collected and used for age estimation during the 2023 survey. Ten (10) additional random stations may be added if data objectives are not met and if additional sampling is deemed feasible.

Creel: Creel data were last collected during March 2016-February 2017. Current creel data would be useful to assess any changes in angler effort towards popular sport fishes in the reservoir and to refine management strategies. Additional investigation into angler harvest of Palmetto and Sunshine Bass would help ascertain if there is a difference in angler catch between the two stocked Hybrid Striped Bass types. Beginning in winter 2021, a year-long roving creel study will be conducted to obtain data pertaining to directed effort towards sport fishes as well as anglers' catches, harvests, releases, as well as expenditures and demographics. Roving creel surveys will be conducted on at least 5 weekend days and 4 weekdays each quarter (≥36 survey days for the year). Additional creel survey components will be conducted in accordance to the evaluation of Hybrid Striped Bass fingerling stockings (TPWD, unpublished).

Literature Cited

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Ausvet. 2020. Epitools: Confidence limits for a proportion calculator. https://epitools.ausvet.com.au/ciproportion?page=CIProportion (Accessed January 2020)

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Dumont, S. C. 2012. Statewide freshwater fisheries monitoring and management program survey report for Fort Phantom Hill Reservoir, 2011. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Dumont, S. C., and B. C. Neely. 2011. A proposed change to Palmetto Bass proportional size distribution length categories. North American Journal of Fisheries Management 31: 722-725.

Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7): 348.

Homer, M. and N. Goldstrohm. 2016. Statewide freshwater fisheries monitoring and management program survey report for Fort Phantom Hill Reservoir, 2015. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

United States Geological Society (USGS). 2020.National water information system: Web interface. Available: http://waterdata.usgs.gov/tx/nwis (May 2020).

Tables and Figures

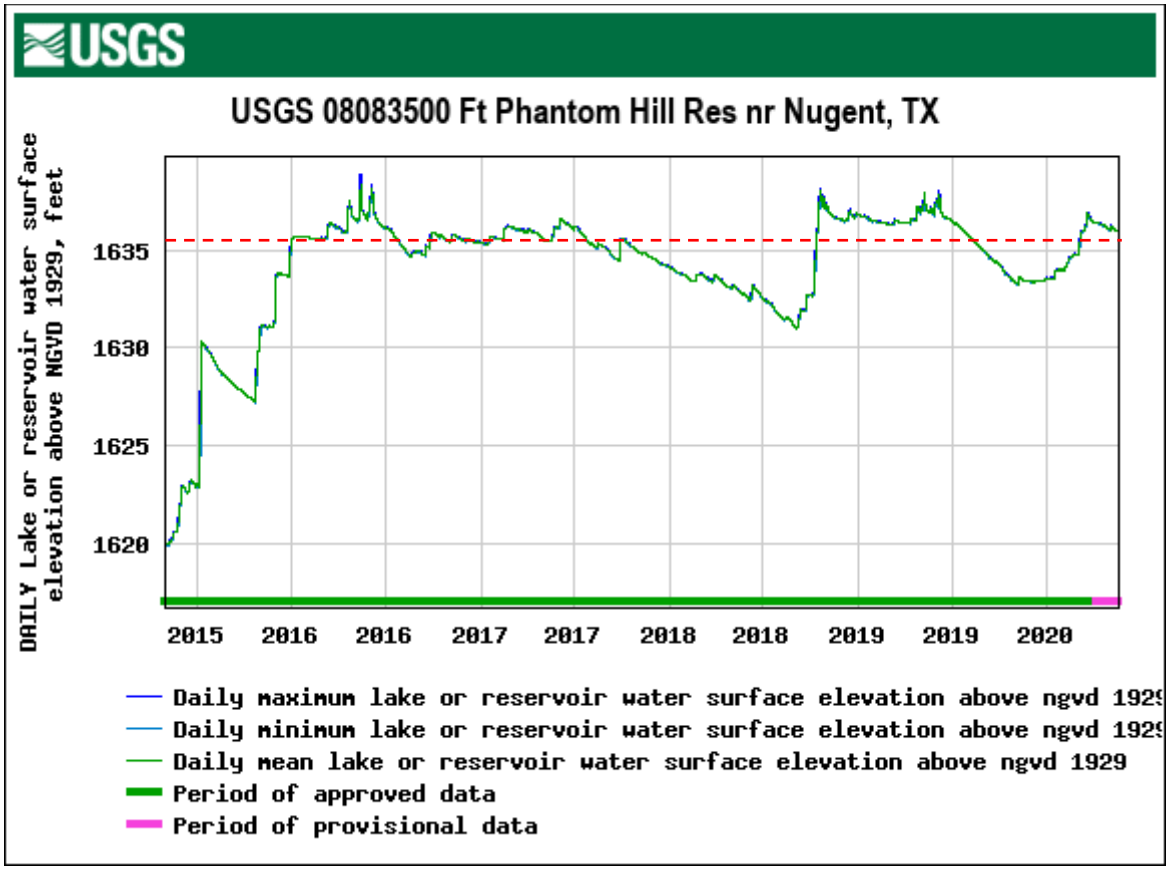


Figure 1. Daily water level elevations in feet above mean sea level (MSL) recorded for Fort Phantom Hill Reservoir, Texas, January 2015-June 2020 (USGS 2020). The dashed line indicates the conservation pool elevation.

Table 1. Characteristics of Fort Phantom Hill Reservoir, Texas.

Characteristic	Description
Year Constructed	1938
Controlling Authority	City of Abilene
County	Jones
Reservoir Type	Tributary
River Basin	Brazos
USGS 8-Digit Hydrologic Unit Watershed	12060102 (Upper Clear Fork Brazos)
Shoreline Development Index	2.0
Conservation Pool Elevation (ft. above mean sea level)	1,636
Bottom Pool Elevation (ft. above mean sea level)	1,582
Conductivity	572-650 µS/cm

Table 2. Boat ramp characteristics for Fort Phantom Hill Reservoir, Texas, June 2020. Reservoir elevation at time of survey was at conservation pool elevation.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	No. of Lanes	Elevation at end of boat ramp (ft.)	Condition
Main Boat Ramp	32.609646º -99.685285º	Y	30	Not Available	1,626	Accessible
Johnson Park Low-water Ramp	32.612061º -99.680364º	Y	15	1	1,619	Inundated; no access
White Elephant/ East Dam Ramp	32.615709º -99.666595º	Y	10	2	1,621	Accessible
Sailboat Club Ramp	32.602651º -99.678928º	Y	10	1	1,627	Accessible; repairs needed
East Lake Road Boat Ramp	32.557539º -99.690366º	Y	30	3	1,628	Accessible
Seabee Park Ramp	32.542811º -99.708241º	Y	10	1	1,629	Accessible; repairs needed

Table 3. Harvest regulations for Fort Phantom Hill 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 Fort Phantom Hill Reservoir, Texas. FRY= >1 in.; FGL = fingerling; ADL = adults; UNK = Unknown.

Species	Year	Number	Size
Threadfin Shad	1984	1,000	ADL
Blue Catfish	1974	10,000	FGL
Palmetto Bass	1977	55,440	UNK
	1979	43,000	UNK
	1983	43,000	UNK
	1984	100,575	FGL
	1986	63,690	FRY
	1987	105,950	FGL
	1988	87,094	FGL
	1989	102,955	FGL
	1991	64,180	FGL
	1992	44,480	FGL
	1993	35,960	FGL
	1994	65,800	FGL
	1995	63,960	FGL
	1996	65,760	FGL
	1997	51,756	FGL
	1998	42,733	FGL
	1999	20,018	FGL
	2002	32,200	FGL
	2003	63,209	FGL
	2004	64,777	FGL
	2005	63,400	FGL
	2006	65,346	FGL
	2007	64,145	FGL
	2008	63,453	FGL
	2009	63,728	FGL
	2011	29,498	FGL
	2013	63,334	FGL
	2014	16,922	FGL
	2017	23,468	FGL
	2018	47,082	FGL
	2019	17,267	FGL
	Total	1,734,180	
Sunshine Bass	2014	18,513	FGL
	2015	63,248	FGL
	2016	76,889	FGL
	2017	23,351	FGL
	2018	31,672	FGL
	2019	20,369	FGL
	2020	190,000	FRY
	Total	405,305	
Largemouth Bass	1973	2,500	UNK
Florida Largemouth Bass	1976	210,087	FGL
	1977	65,280	FGL
	1979	10,000	FGL

	1986	152,000	FRY
	1994	213,334	FGL
	1995	10,000	FGL
	1997	213,179	FGL
	2001	212,650	FGL
	2014	196,956	FGL
	2016	46,925	FGL
	2017	24,148	FGL
	Total	1,354,559	
Walleye	1973	770,000	FRY
	1974	700,000	FRY
	1975	800,000	FRY
	1979	6,797,500	FRY
	1982	335,738	FRY
	1983	6,996,441	FRY
	1985	8,637,242	FRY
	1991	2,440,295	FRY
	1993	8,520,000	FRY
	1995	8,500,000	FRY
	Total	44,497,216	
Redear Sunfish	1981	42,800	UNK

Table 5. Objective-based sampling plan components for Fort Phantom Hill Reservoir, Texas 2019–2020.

Gear/target species	Survey Objective	Metrics	Sampling Objective
Electrofishing			
Gizzard Shad [a]	Relative Abundance	CPUE-Total	RSE ≤ 25
	Size Structure	Length frequency	N ≥ 50
	Prey Availability	IOV	N ≥ 50
Bluegill [a]	Relative Abundance	CPUE-Total	RSE ≤ 25
	Size Structure	PSD, Length frequency	N ≥ 50 stock
Largemouth Bass	Relative Abundance	CPUE-Total, Stock-CPUE CPUE-14	RSE ≤ 25 Practical effort
	Size Structure	PSD, Length frequency	N ≥ 50 stock
	Age and Growth	Age at 14 inches TL	N = 13, 13.0-14.9 inches
	Condition	W_r	5 fish/inch group
	Genetics	Allele Frequency	N=30
Trap netting			
Crappie	Relative Abundance	CPUE-Total, Stock-CPUE CPUE-10	RSE ≤ 25 Practical effort
	Size Structure	PSD, Length frequency	N ≥ 50 stock
	Body Condition	W_r	10 fish/inch group
	Age and Growth	Age at 10 inches TL	N = 13, 9.0-10.9 inches

Table 6. Percent (%) occurrence and associated 95% confidence intervals (parentheses) for structural habitat types throughout the reservoir and along the shoreline encountered during the summer 2019 habitat survey (274 points), Fort Phantom Hill Reservoir, Texas. Water level at time of survey was approximately 1 ft. below conservation pool level.

Habitat Type	% Shoreline
Bridge	1.1 (±2.2)
Gravel (GRSH)	2.2 (±3.0)
Boat Ramp	3.3 (±3.7)
Bulkhead (BULK)	7.8 (±5.5)
Rock Bluff (ROBL)	18.9 (±8.1)
Boat Dock/Pier (PIDO)	25.6 (±9.0)
Rocky Shoreline (ROSH)	27.8 (±9.3)
Natural Shoreline (NASH)	43.3 (±10.2)

Table 7. Percent (%) occurrence and associated 95% confidence intervals (parentheses) for vegetation types throughout the reservoir (274 points) and along the shoreline (141 points) encountered during the summer 2019 vegetation survey, Fort Phantom Hill Reservoir, Texas. Water level at time of survey was approximately 1 ft. below conservation pool level.

Habitat type	% of Entire Reservoir	% Shoreline
Woody Debris/Logs	<1.0	3.3 (±3.7)
Flatsedge	2.2 (±2.9)	1.1 (±2.2)
Flooded Terrestrial Vegetation	2.2 (±2.9)	12.2 (±6.8)
Waterwillow	3.3 (±3.6)	8.9 (±5.9)
Bulrush	8.7 (±5.6)	23.3 (±8.7)
Standing Timber	34.8 (±9.5)	30.0 (±9.5)
Open Water/Featureless	57.6 (±9.9)	40.0 (±10.2)

Table 8. Directed effort (hours), relative standard error in parentheses, and percent of overall effort by species group reported in the March 1, 2016 – February 28, 2017 roving creel survey, Fort Phantom Hill Reservoir, Texas.

Species Group	Effort (hours)	Percent of Overall Effort (%)
Catfishes	28,691.2 (15)	36.2
Anything	21,641.6 (15)	27.3
White Crappie	14,609.9 (16)	18.5
Hybrid Striped Bass	8,091.3 (19)	10.2
Largemouth Bass	4,605.7 (23)	5.8
Common Carp	959.4 (48)	1.2
Sunfishes	333.9 (87)	0.04
White Bass	102.7 (139)	0.1

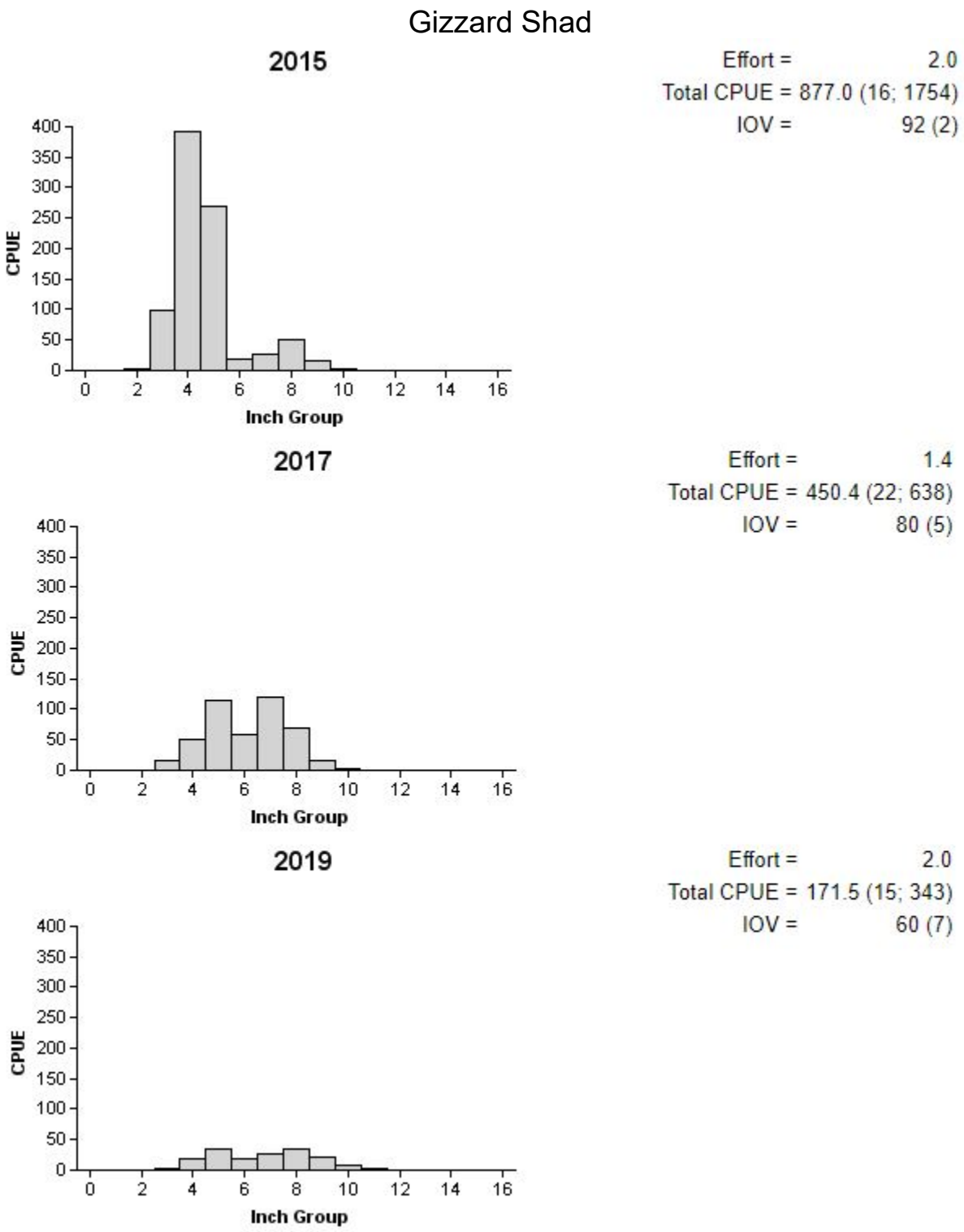


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2015, 2017, and 2019.

Bluegill

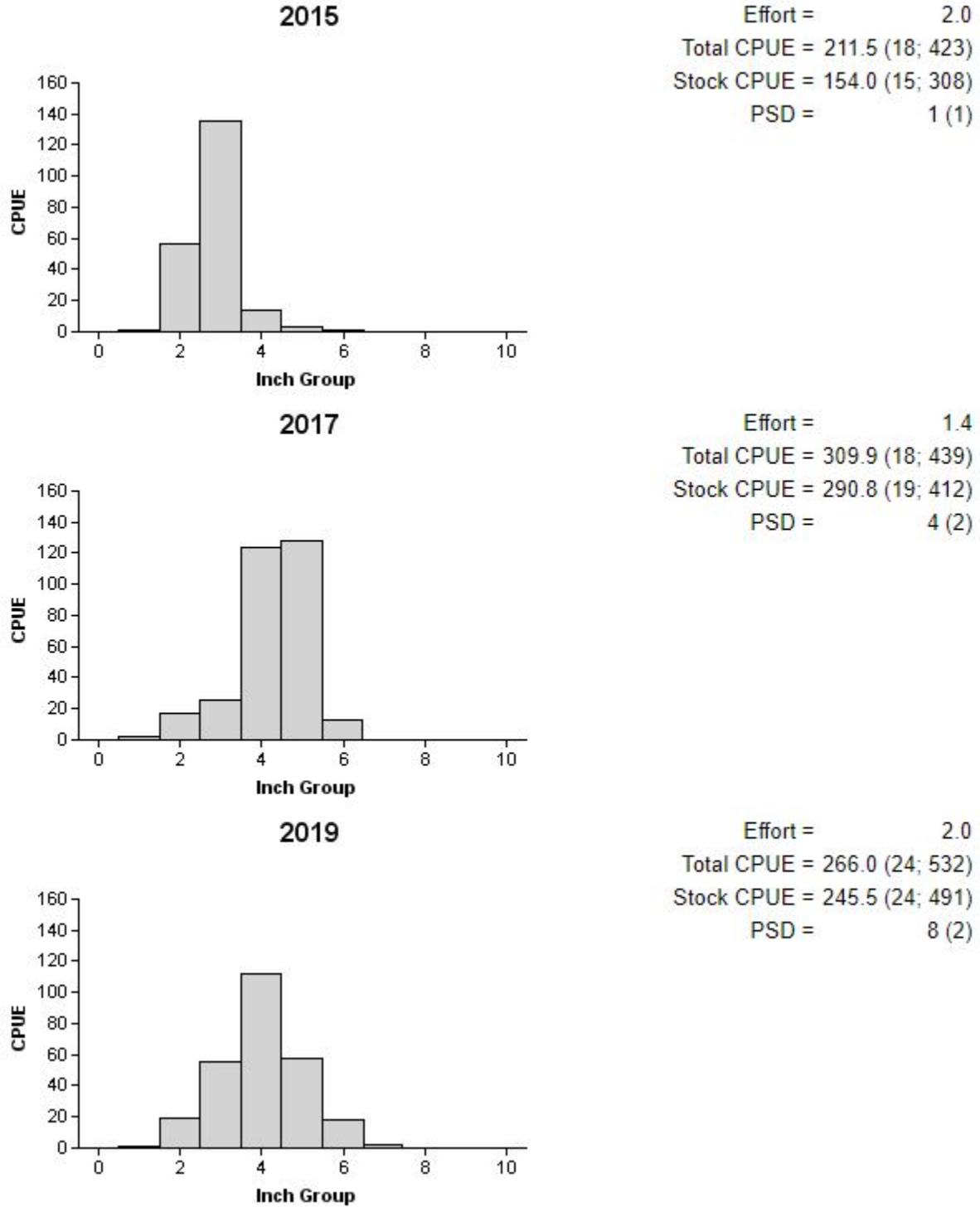


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2015, 2017, and 2019.

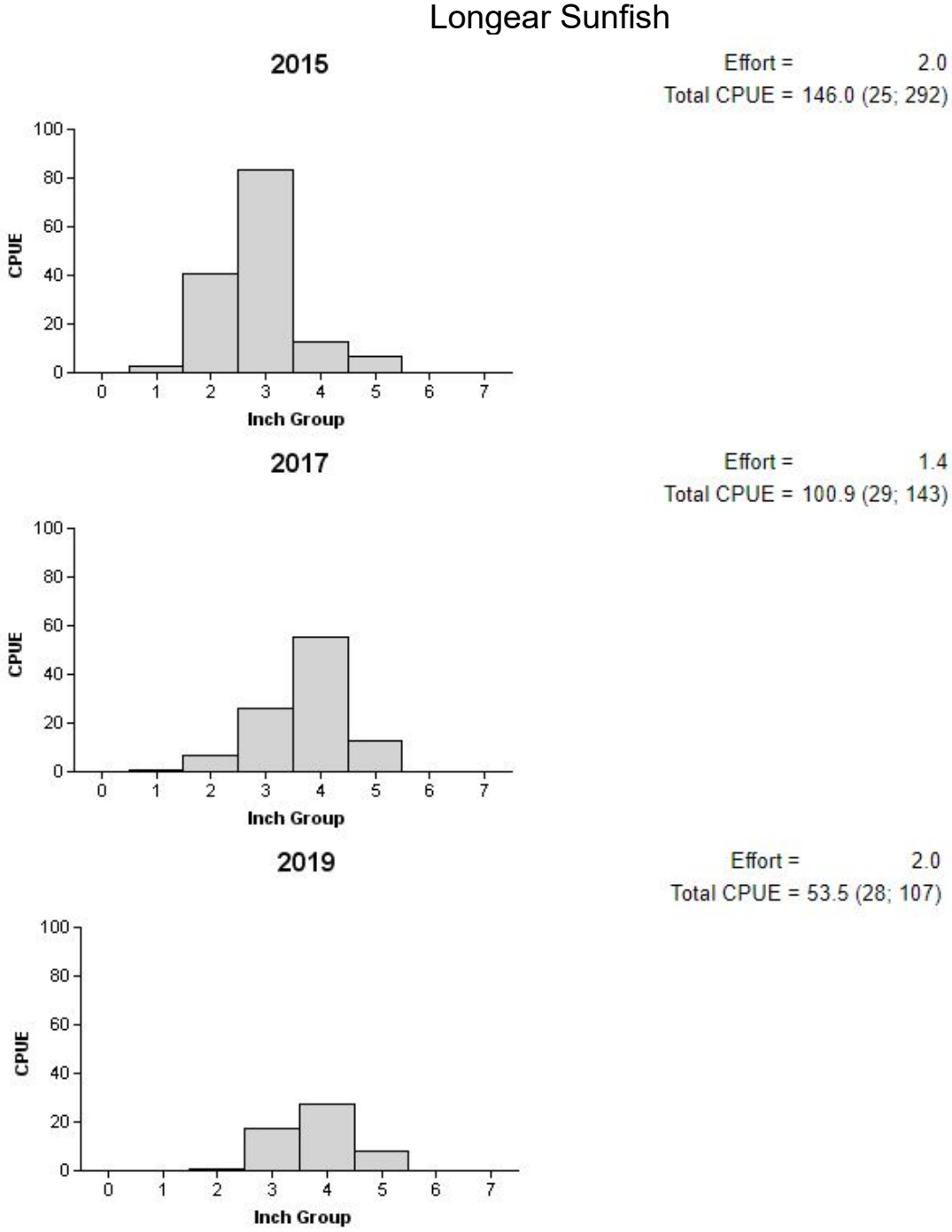


Figure 4. Number of Longear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2015, 2017, and 2019.

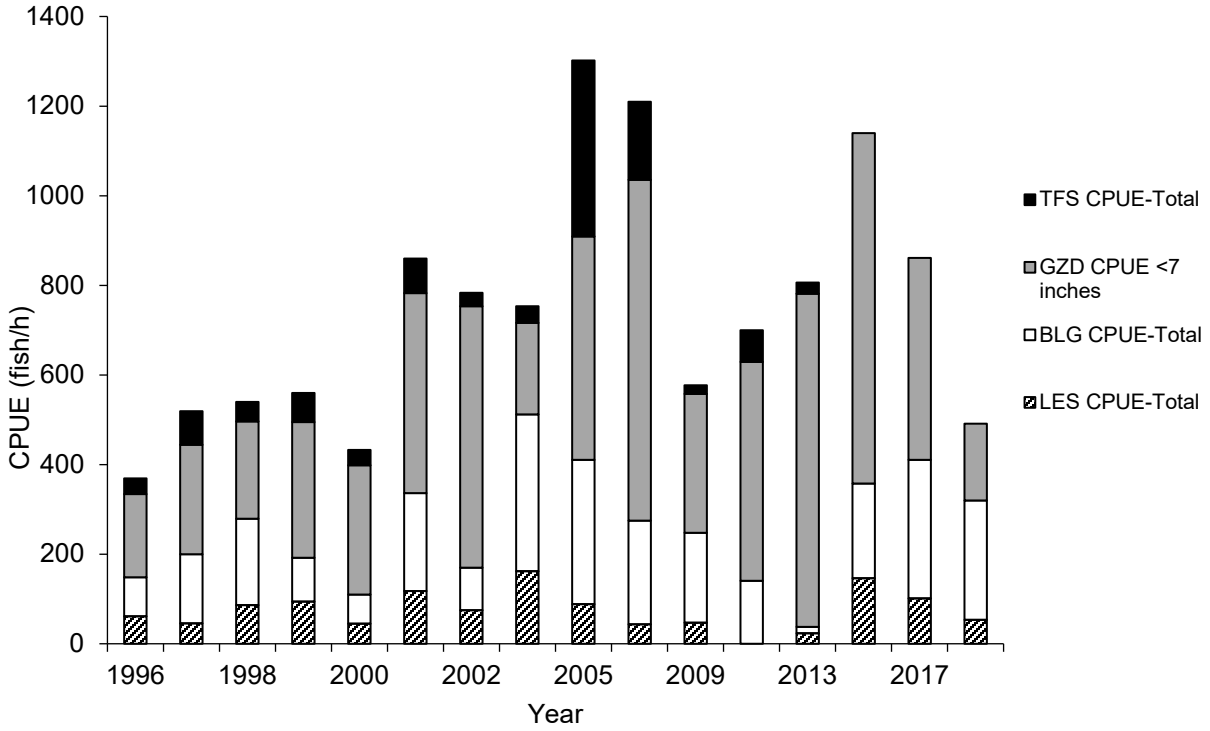


Figure 5. Trends in cumulative catch per unit effort (CPUE; fish/h) for the four most sampleable and common prey species, Threadfin Shad (TFS), Gizzard Shad (GZD), Bluegill (BLG), and Longear Sunfish (LES) observed during fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 1996-2019.

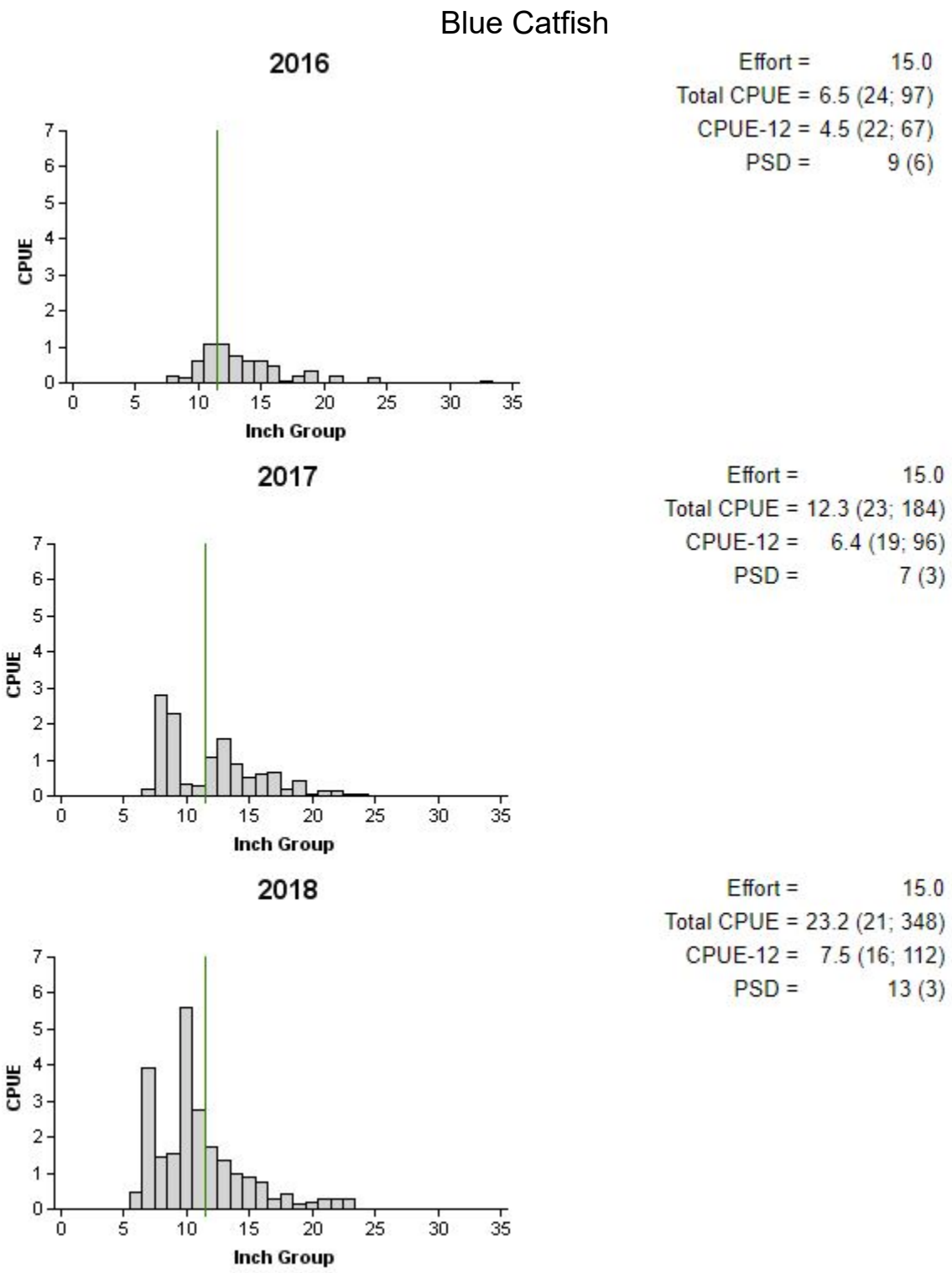


Figure 6. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Fort Phantom Hill Reservoir, Texas, 2016, 2017, and 2018. Vertical line represents the 12-in. minimum length limit.

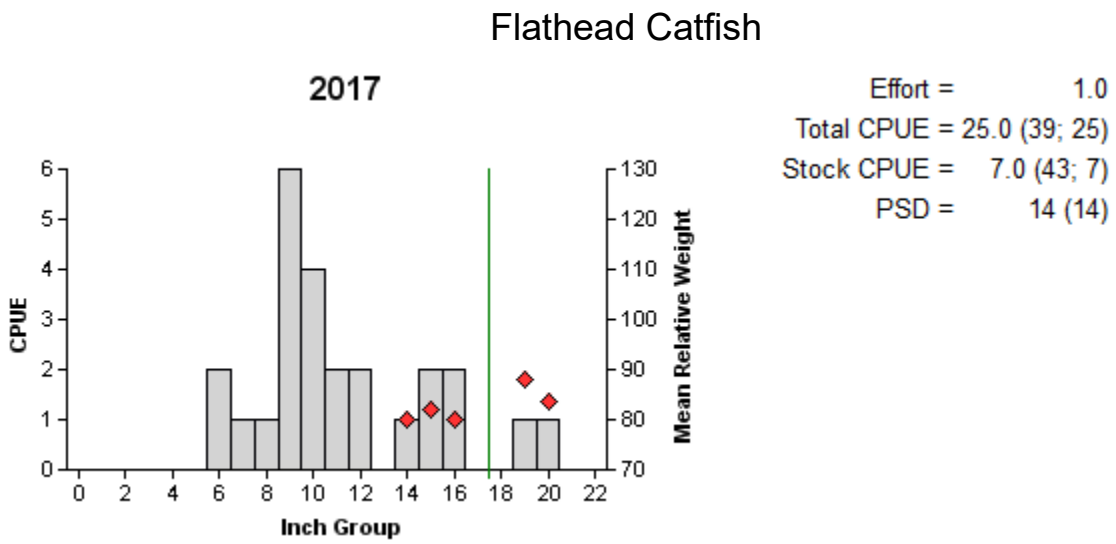


Figure 7. Number of Flathead Catfish caught per hour (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses for late summer low-frequency electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2017. Vertical line represents the 18-in. minimum length limit.

Catfishes

Table 9. Creel survey statistics for catfishes at Fort Phantom Hill Reservoir, Texas, from March 2007 through August 2007, March 2016 through August 2016, and March 2016 through February 2017. Total catch per hour is for anglers targeting catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	March-August	March-August	Year
	2007	2016	2016/2017
Surface area (acres)	2,487	4,246	4,246
Directed effort (h)	12,806.7 (13)	22,310.7 (19)	28,691.2 (16)
Directed effort/acre	5.2 (13)	5.25 (19)	6.76 (16)
Total catch per hour	0.5 (28)	0.3 (33)	0.3 (35)
Total harvest			
Blue Catfish	5,982.9 (28)	2,450.0 (52)	3,089.3 (42)
Channel Catfish	954.2 (74)	155.6 (194)	323.3 (113)
Harvest/acre	1.2 (40)	0.5 (56)	0.6 (58)
Blue Catfish	2.4	0.58 (52)	0.6
Channel Catfish	0.4	0.04 (194)	0.06
Percent			
legal released			
Blue Catfish	36.0	58.4	59.1
Channel Catfish	30.5	48.4	56.0

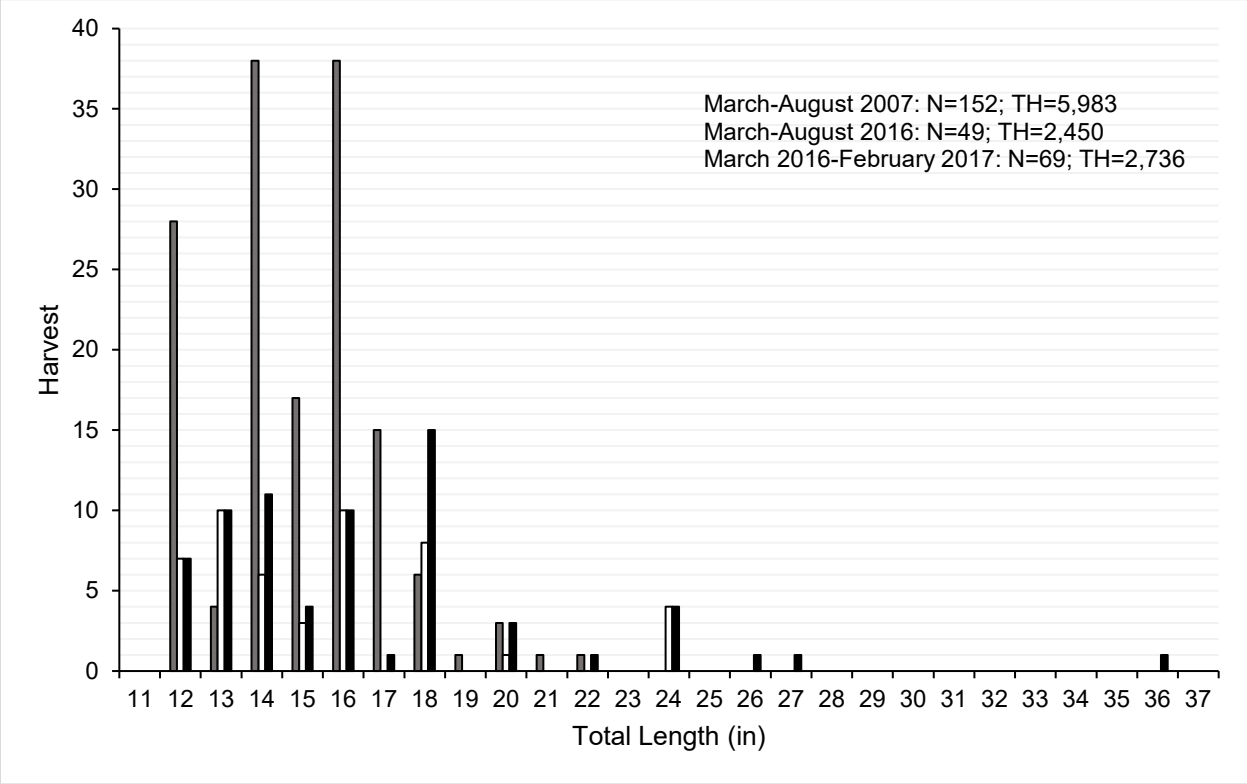


Figure 8. Length frequency of harvested Blue Catfish by all anglers combined observed during creel surveys at Fort Phantom Hill Reservoir, Texas, March to June 2007 (gray bars) and 2016 (white bars), as well as March 2016 to February 2017 (black bars). N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

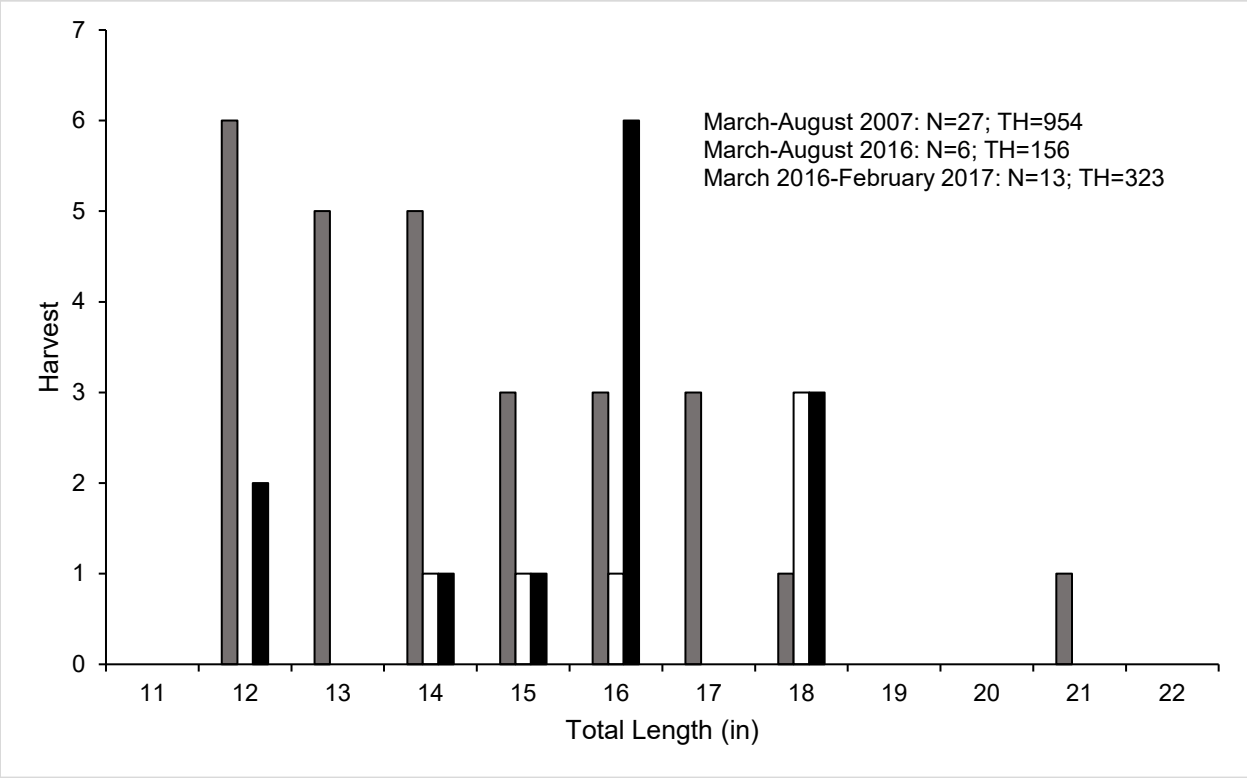


Figure 9. Length frequency of harvested Channel Catfish by all anglers combined observed during creel surveys at Fort Phantom Hill Reservoir, Texas, March to June 2007 (gray bars) and 2016 (white bars), as well as March 2016 to February 2017 (black bars). N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

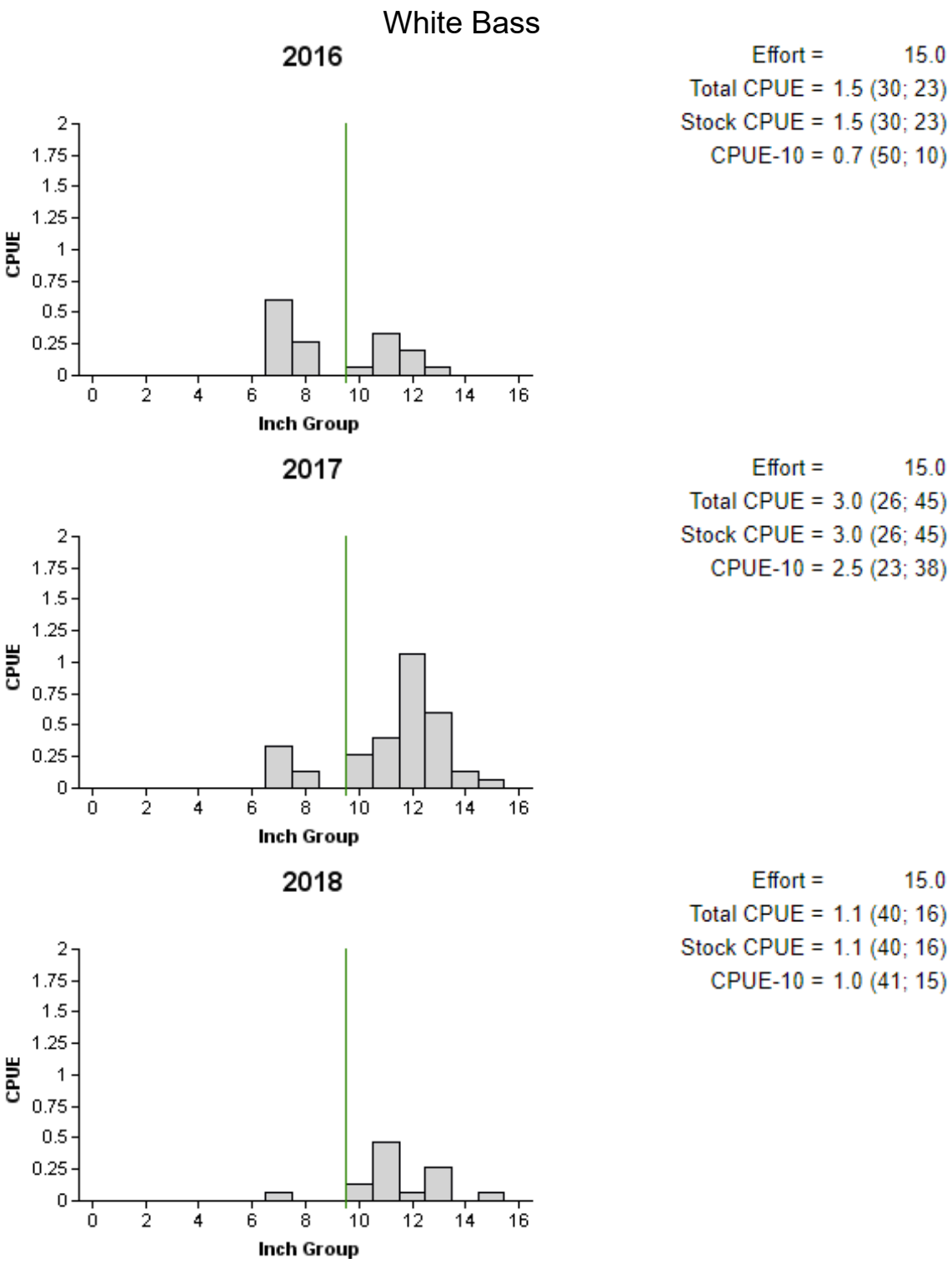


Figure 10. Number of White Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Fort Phantom Hill Reservoir, Texas, 2016, 2017, and 2018. Vertical line represents the 10-in. minimum length limit.

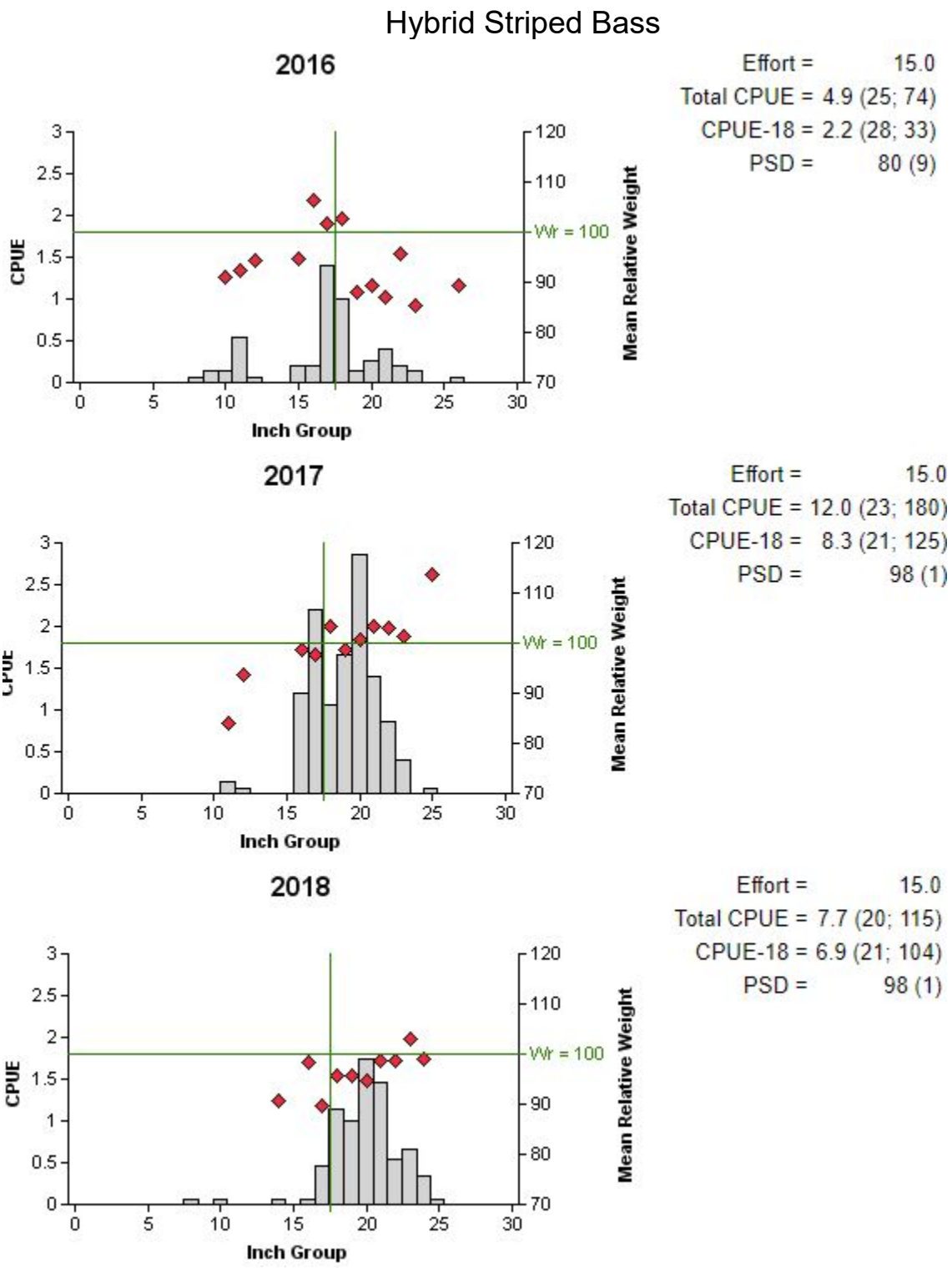


Figure 11. Number of Hybrid Striped Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weights by inch group (diamonds) for spring gill netting surveys, Fort Phantom Hill Reservoir, Texas, 2016, 2017, and 2018. Vertical line denotes the 18-in minimum length limit, and the horizontal line represents the relative weight = 100.

Hybrid Striped Bass

Table 10. Creel survey statistics for Hybrid Striped Bass at Fort Phantom Hill Reservoir, Texas, from March 2007 through August 2007, March 2016 through August 2016, and March 2016 through February 2017. Total catch per hour is for anglers targeting Hybrid Striped Bass and total harvest is the estimated number of Hybrid Striped Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	March-August 2007	March-August 2016	Year 2016/2017
Surface area (acres)	2,487	4,246	4,246
Directed effort (h)	6,776.2 (16)	5,810.1 (23)	8,091.3 (19)
Directed effort/acre	2.7 (16)	1.4 (23)	1.9 (20)
Total catch per hour	1.4 (52)	0.3 (61)	0.5 (69)
Total harvest	2,473.9 (43)	665.8 (68)	1,212.3 (47)
Harvest/acre	1.0 (43)	0.2 (68)	0.27 (47)
Percent legal released	58.1	67.8	68.0

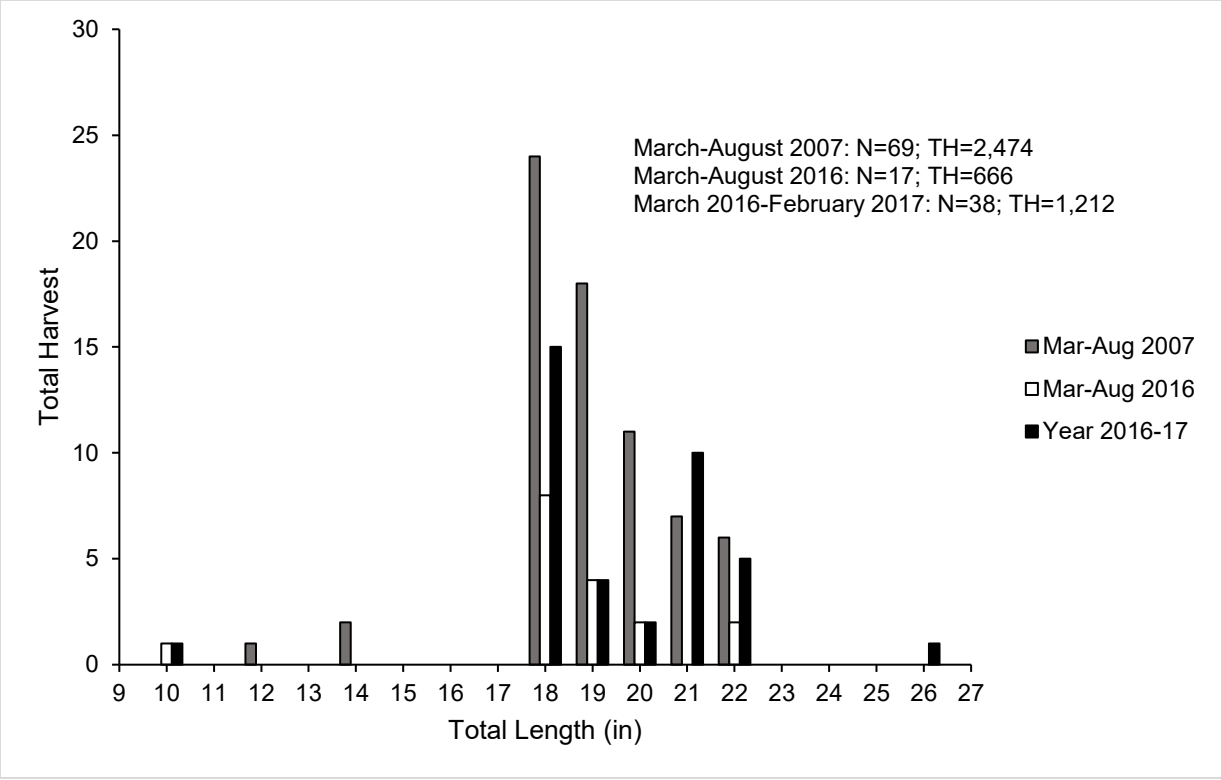


Figure 12. Length frequency of harvested Hybrid Striped Bass by all anglers combined observed during creel surveys at Fort Phantom Hill Reservoir, Texas, March to June 2007 (gray bars) and 2016 (white bars), as well as March 2016 to February 2017 (black bars). N is the number of harvested Hybrid Striped Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

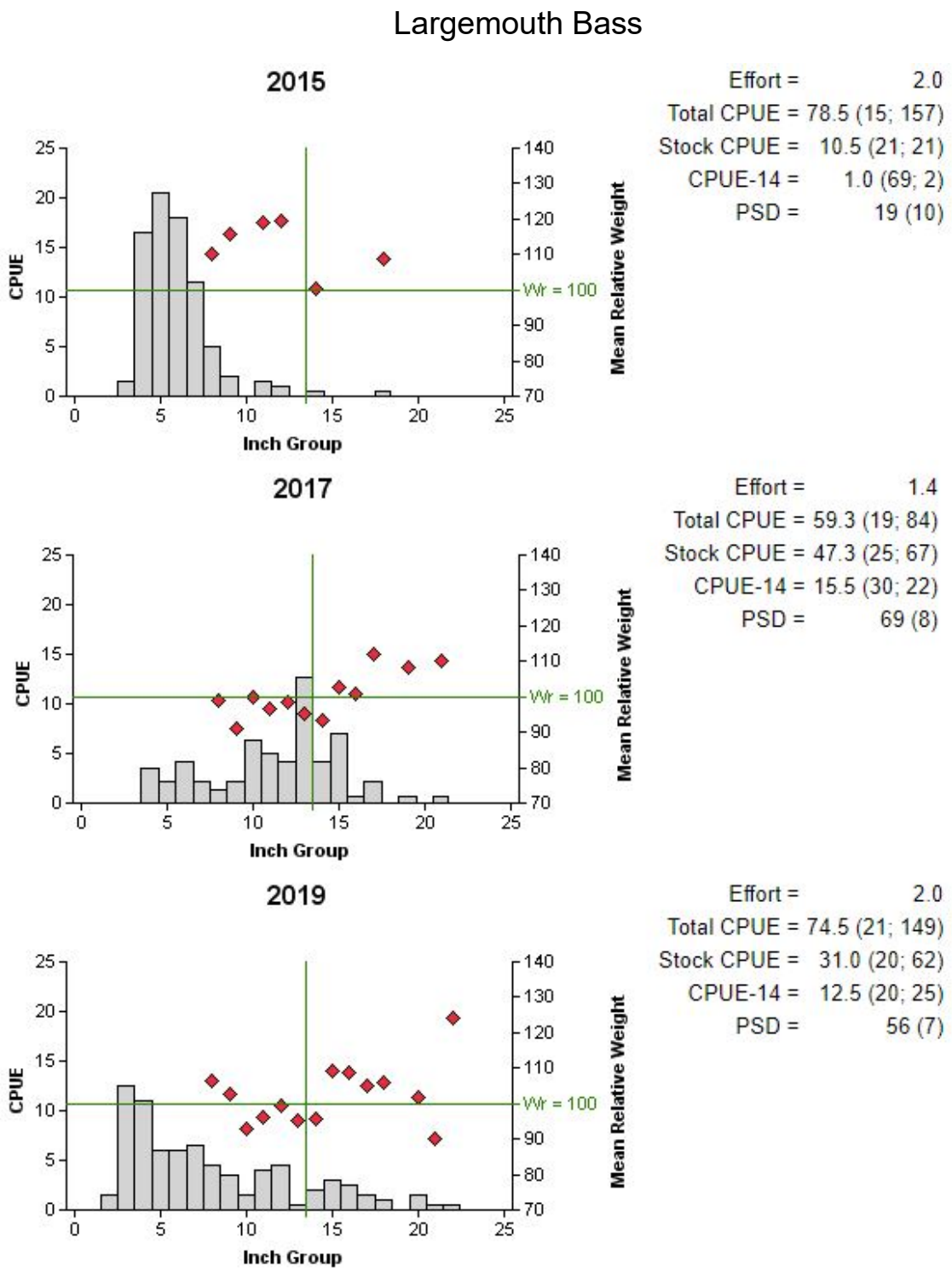


Figure 13. Number of Largemouth Bass caught per hour (CPUE), population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weights (diamonds) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2015, 2017, and 2019. Vertical line denotes the 14-in minimum length limit, and the horizontal line represents the relative weight = 100.

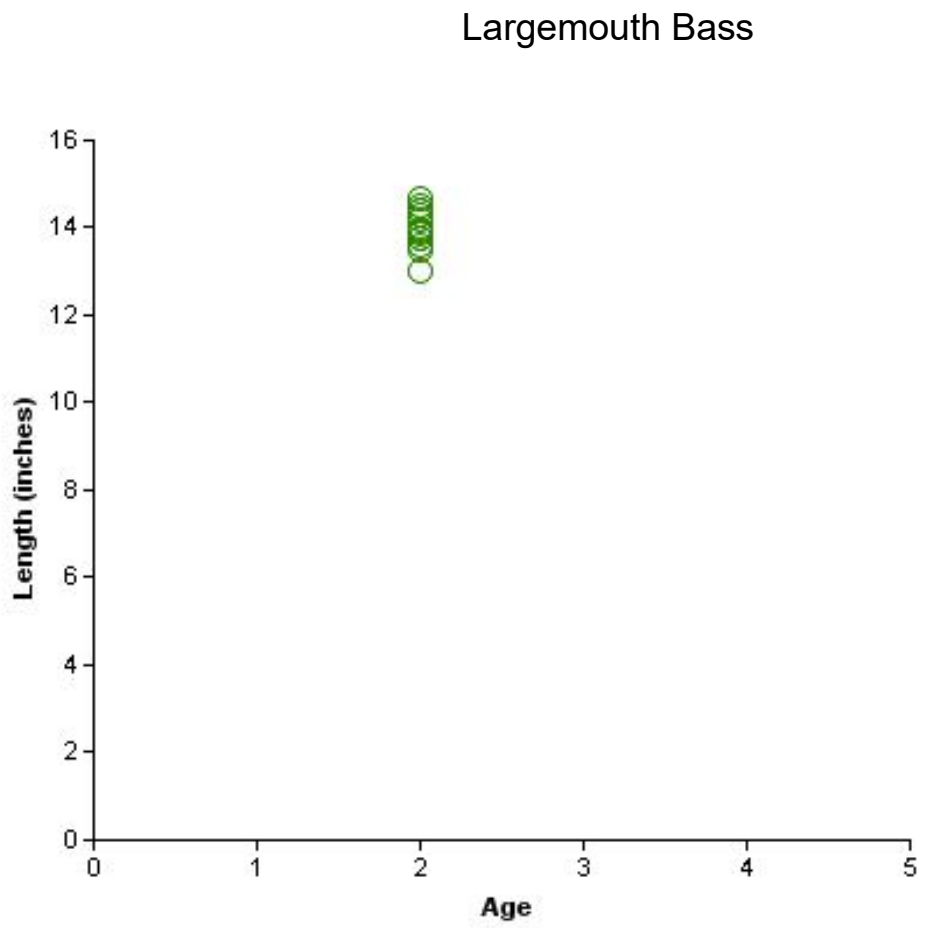


Figure 14. Age distribution of Largemouth Bass 13.0-14.9 inches TL collected during fall 2017 electrofishing, Ft. Phantom Hill Reservoir, Texas.

Table 11. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Fort Phantom Hill Reservoir, Texas, 1998, 2003, 2005, 2011, 2015, 2019. FLMB = Florida Largemouth Bass; NLMB = Northern Largemouth Bass; Fx = second or higher generation 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	Fx	NLMB	% FLMB alleles	% pure FLMB
1998	29	2	24	3	41.4	6.9
2003	31	3	28	0	61.9	9.7
2005	72	2	70	0	56.8	2.8
2011	30	2	28	0	56.8	6.7
2015	30	2	27	1	60.0	6.7
2019	30	1	29	0	58.4%	3.3

Largemouth Bass

Table 12. Creel survey statistics for Largemouth Bass at Fort Phantom Hill Reservoir, Texas, from March 2007 through August 2007, March 2016 through August 2016, and March 2016 through February 2017. Total catch per hour is for anglers targeting Largemouth Bass and total harvest is the estimated number of Largemouth Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	March-August	March-August	Year
	2007	2016	2016/2017
Surface area (acres)	2,487	4,246	4,246
Directed effort (h)	2,655.7 (22)	3,248.2 (29)	4,605.7 (23)
Directed effort/acre	1.1 (22)	0.8 (29)	1.1 (23)
Total catch per hour	1.35 (34)	0.15 (66)	0.38 (44)
Total harvest	751.85 (95)	29.07 (157)	29.07 (157)
Harvest/acre	0.30 (95)	<0.01 (157)	<0.01 (157)
Percent legal released	67.9	83.2	87.2

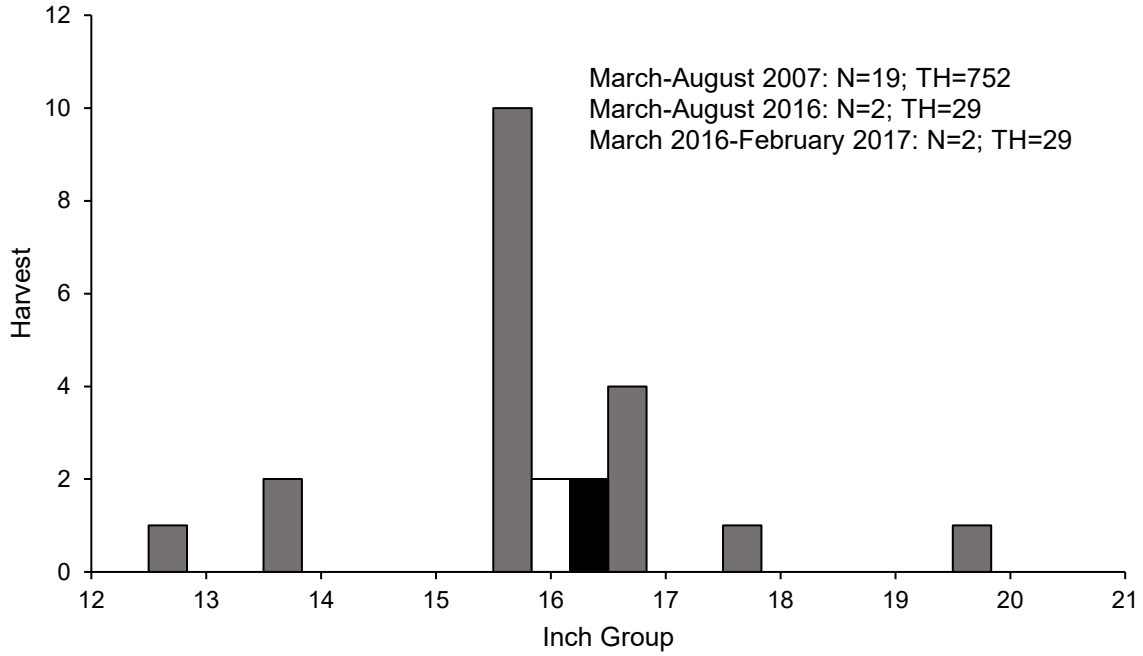


Figure 15. Length frequency of harvested Largemouth Bass by all anglers combined observed during creel surveys at Fort Phantom Hill Reservoir, Texas, March to June 2007 (gray bars) and 2016 (white bars), as well as March 2016 to February 2017 (black bars). N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Crappie

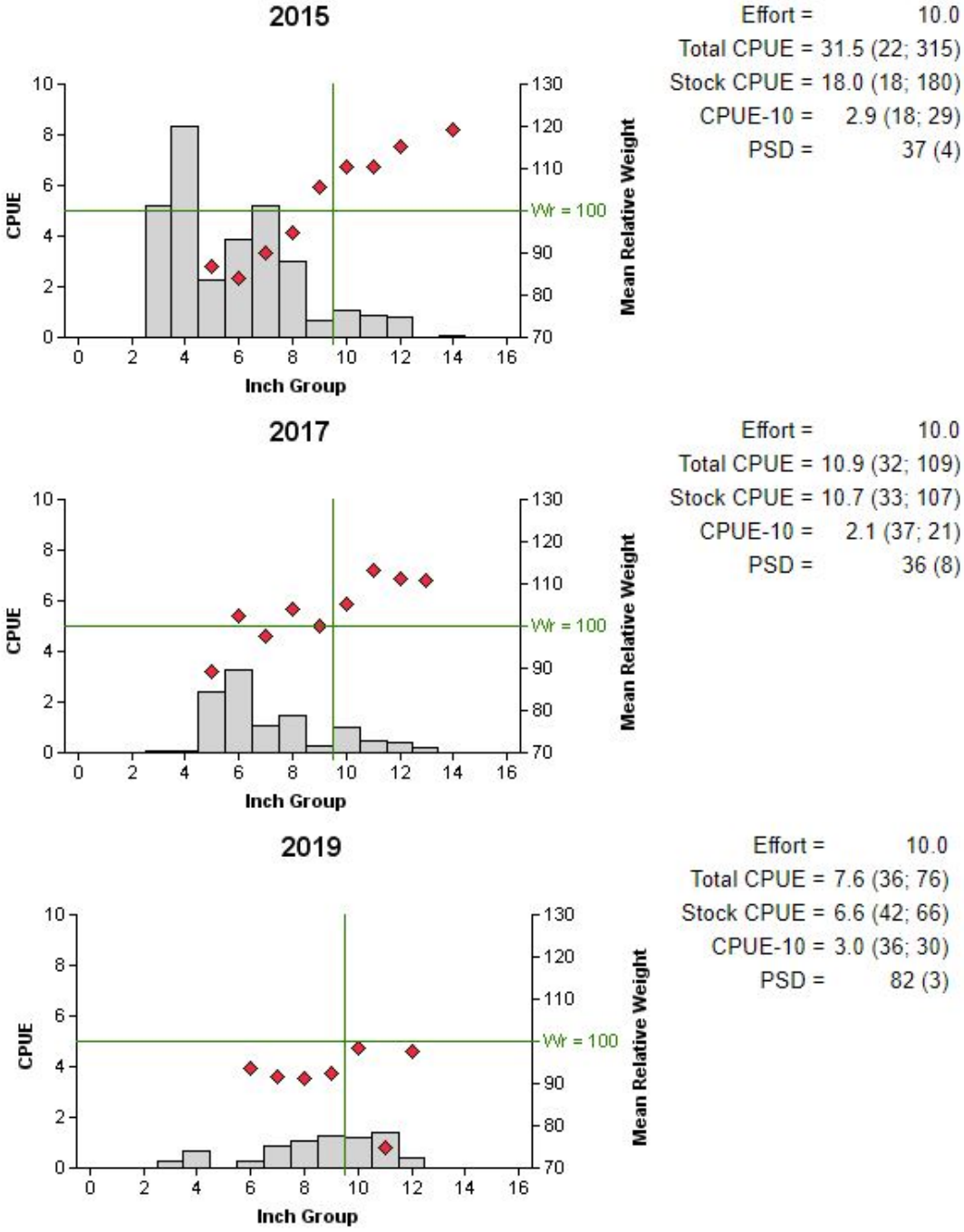


Figure 16. Number of White Crappie caught per net night (CPUE), population indices (RSE and N for CPUE and SE for size structure are in parentheses), and mean relative weights (diamonds) for fall trap netting surveys, Fort Phantom Hill Reservoir, Texas, 2015, 2017, and 2019. Vertical line denotes the 10-in minimum length limit, and the horizontal line represents the relative weight = 100.

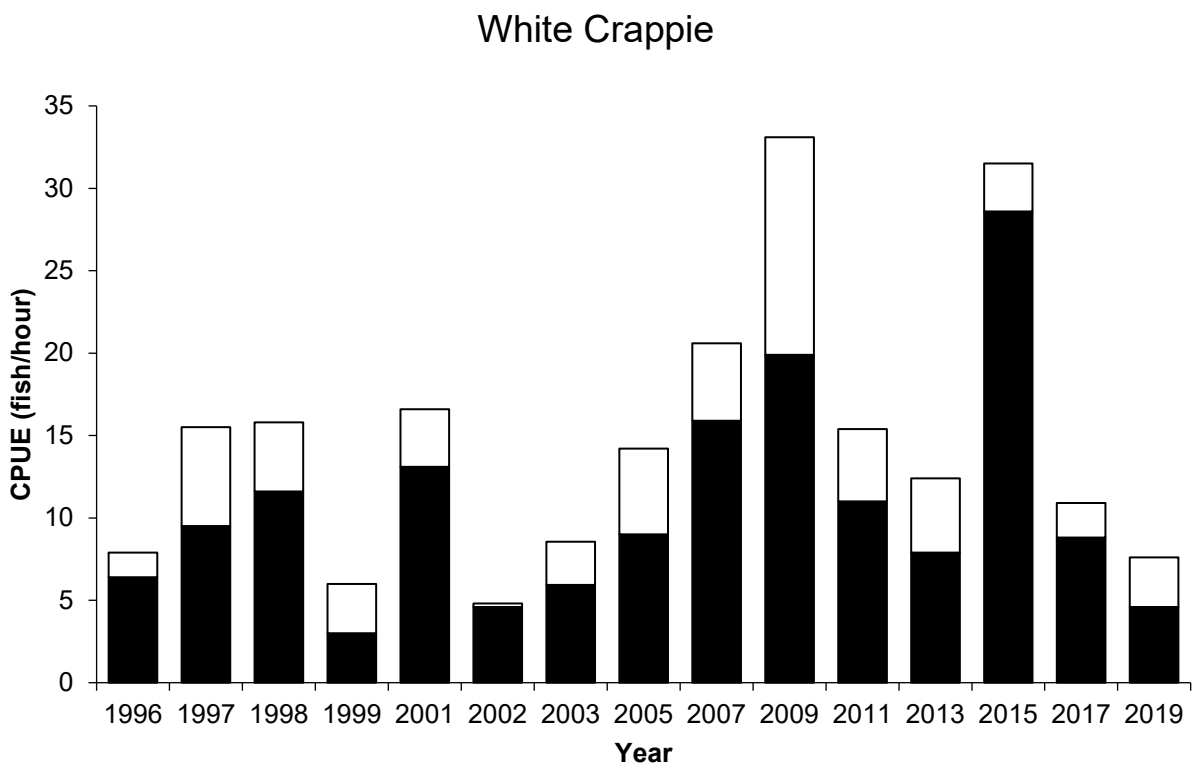


Figure 17. Cumulative catch rates of sub-legal (<10 inches TL; black bars) and legal (≥10 inches TL; white bars) White Crappie caught per net night during fall trap netting surveys, Fort Phantom Hill Reservoir, Texas, 1996-2019.

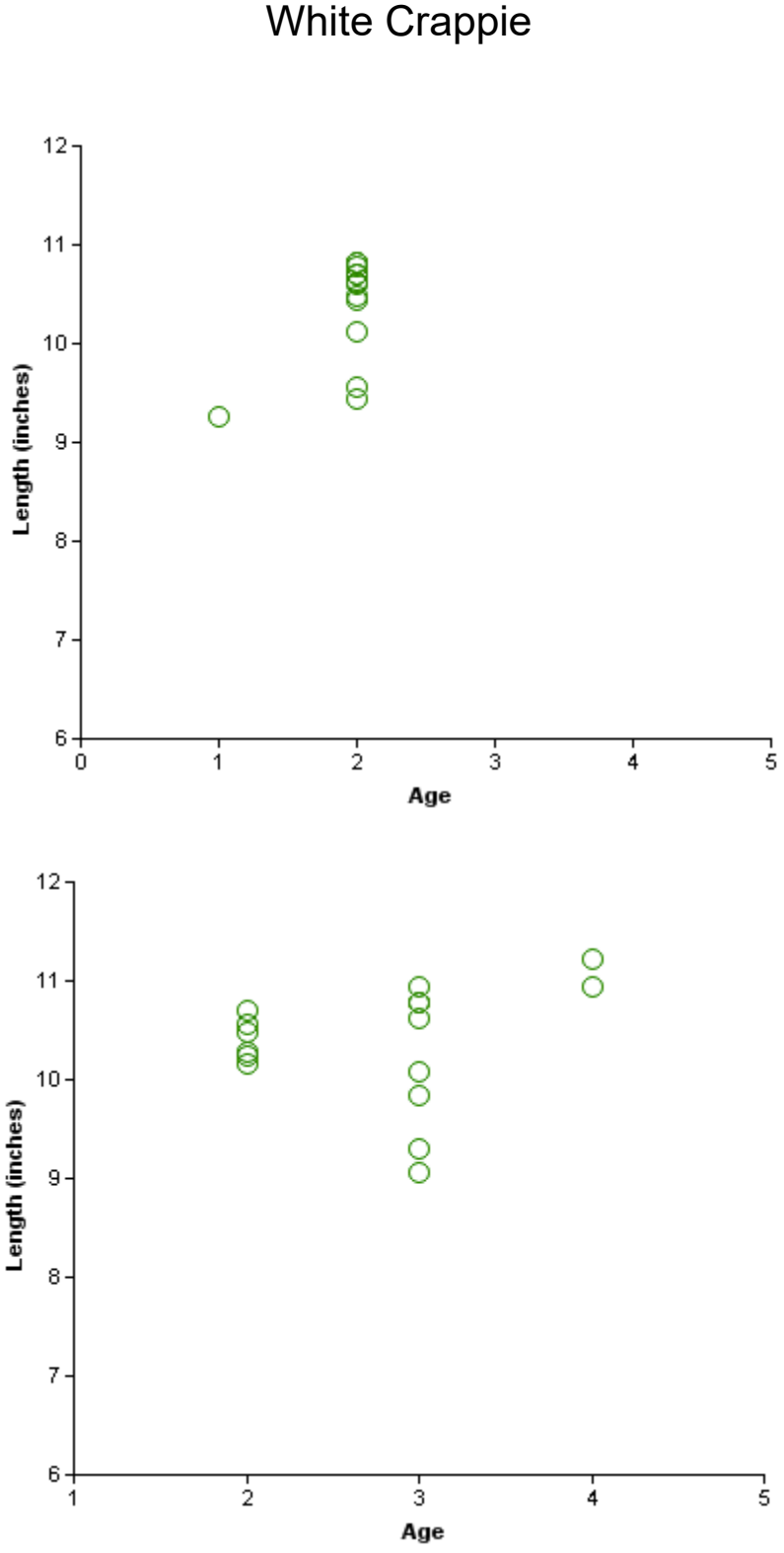


Figure 18. Age distribution of 13 randomly selected White Crappie, 9.0-11.0 inches TL, collected during fall 2017 trap netting (top) and 16 randomly selected fish in the 2019 survey (bottom), Ft. Phantom Hill Reservoir, Texas.

White Crappie

Table 13. Creel survey statistics for White Crappie at Fort Phantom Hill Reservoir, Texas, from March 2007 through August 2007, March 2016 through August 2016, and March 2016 through February 2017. Total catch per hour is for anglers targeting Largemouth Bass and total harvest is the estimated number of Largemouth Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	March-August	March-August	Year
	2007	2016	2016/2017
Surface area (acres)	2,487	4,246	4,246
Directed effort (h)	17,528.0 (13)	11,400.3 (18)	14,609.9 (16)
Directed effort/acre	7.1 (13)	2.7 (19)	3.2
Total catch per hour	1.9 (26)	0.4 (56)	0.7 (48)
Total harvest	12,965.9 (25)	940.9 (52)	2,148.1 (38)
Harvest/acre	5.2 (25)	0.22 (52)	0.51 (38)
Percent legal released	6.0	0.00	18.1

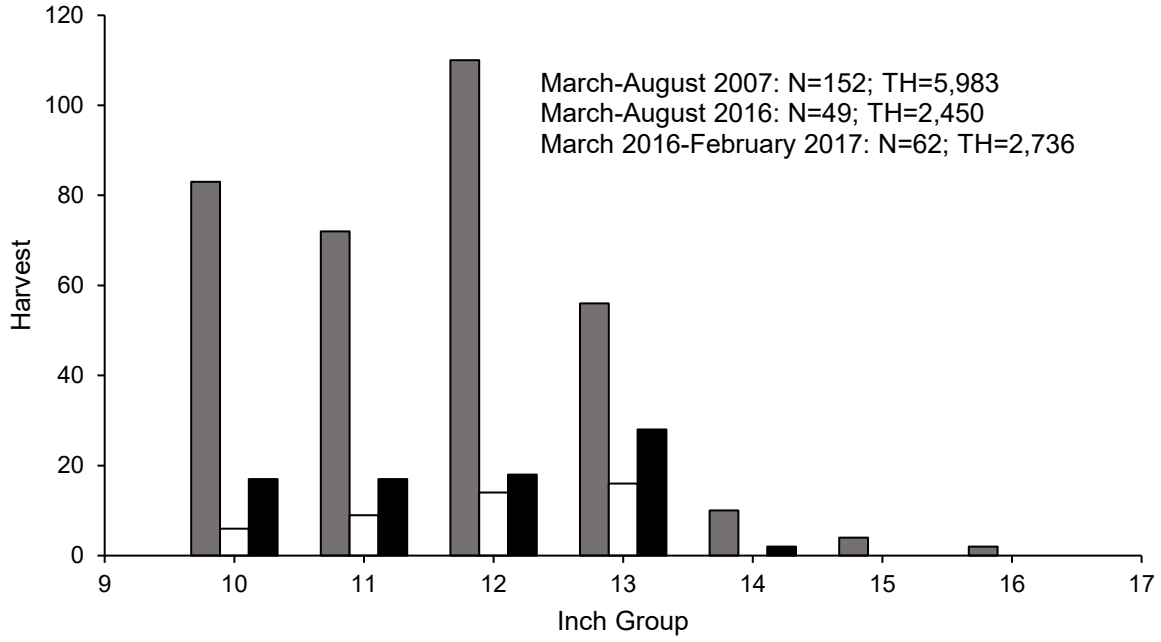


Figure 19. Length frequency of harvested White Crappie by all anglers combined observed during creel surveys at Fort Phantom Hill Reservoir, Texas, March to June 2007 (gray bars) and 2016 (white bars), as well as March 2016 to February 2017 (black bars). N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Proposed Sampling Schedule

Table 14. Proposed sampling schedule for Ft. Phantom Hill 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.

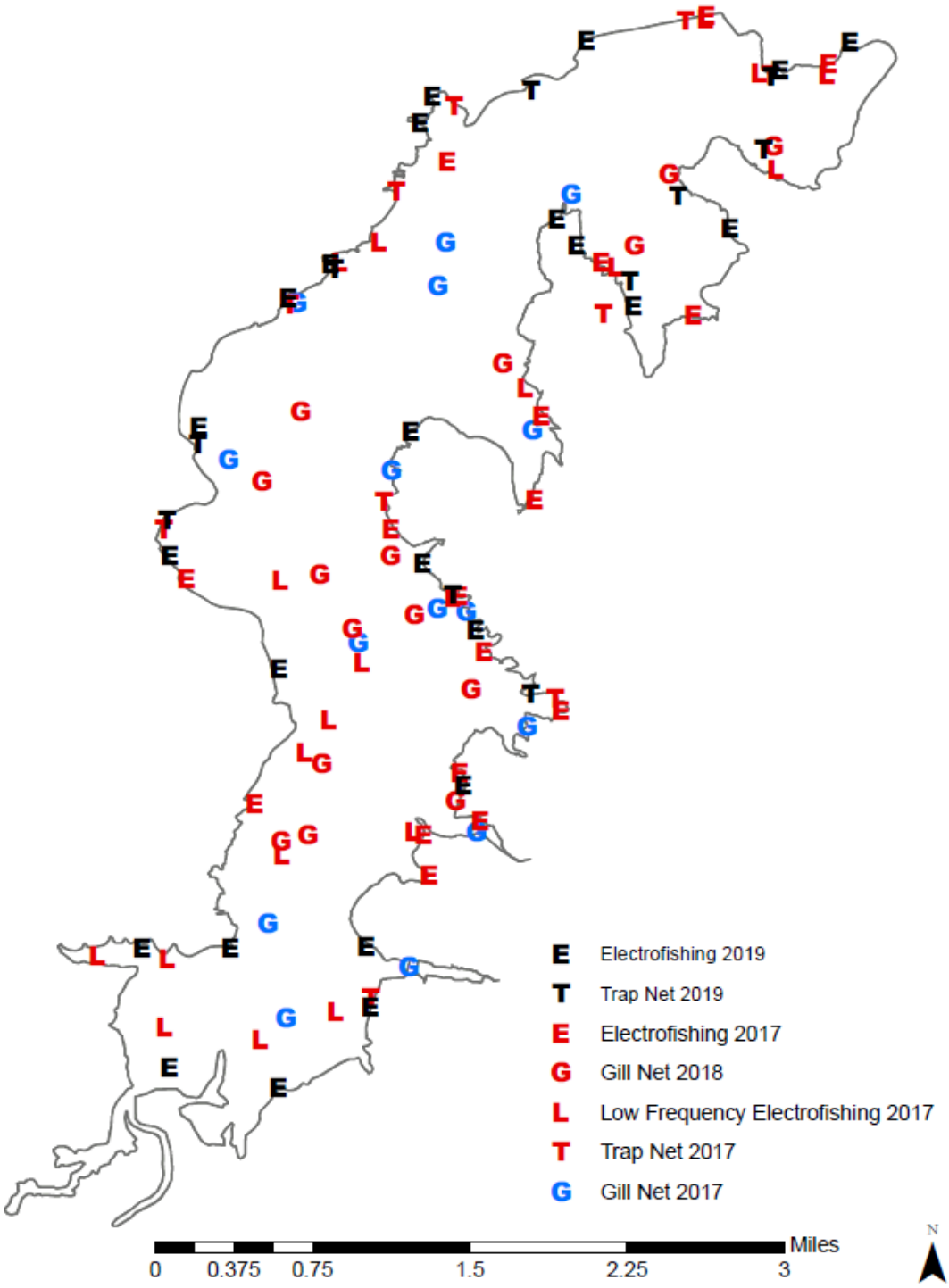
	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Structural Habitat				S
Vegetation				S
Electrofishing – Fall				S
Trap netting		A		S
Gill netting			A	
Creel survey		A		
Report				S

Appendix A. Catch rates for all species from all gear types

Number (N) and catch per unit effort (CPUE; RSE in parentheses) of all target species collected from all gear types from Fort Phantom Hill Reservoir, Texas, 2019. Sampling effort was two hours for fall electrofishing and 10 net nights for fall trap netting.

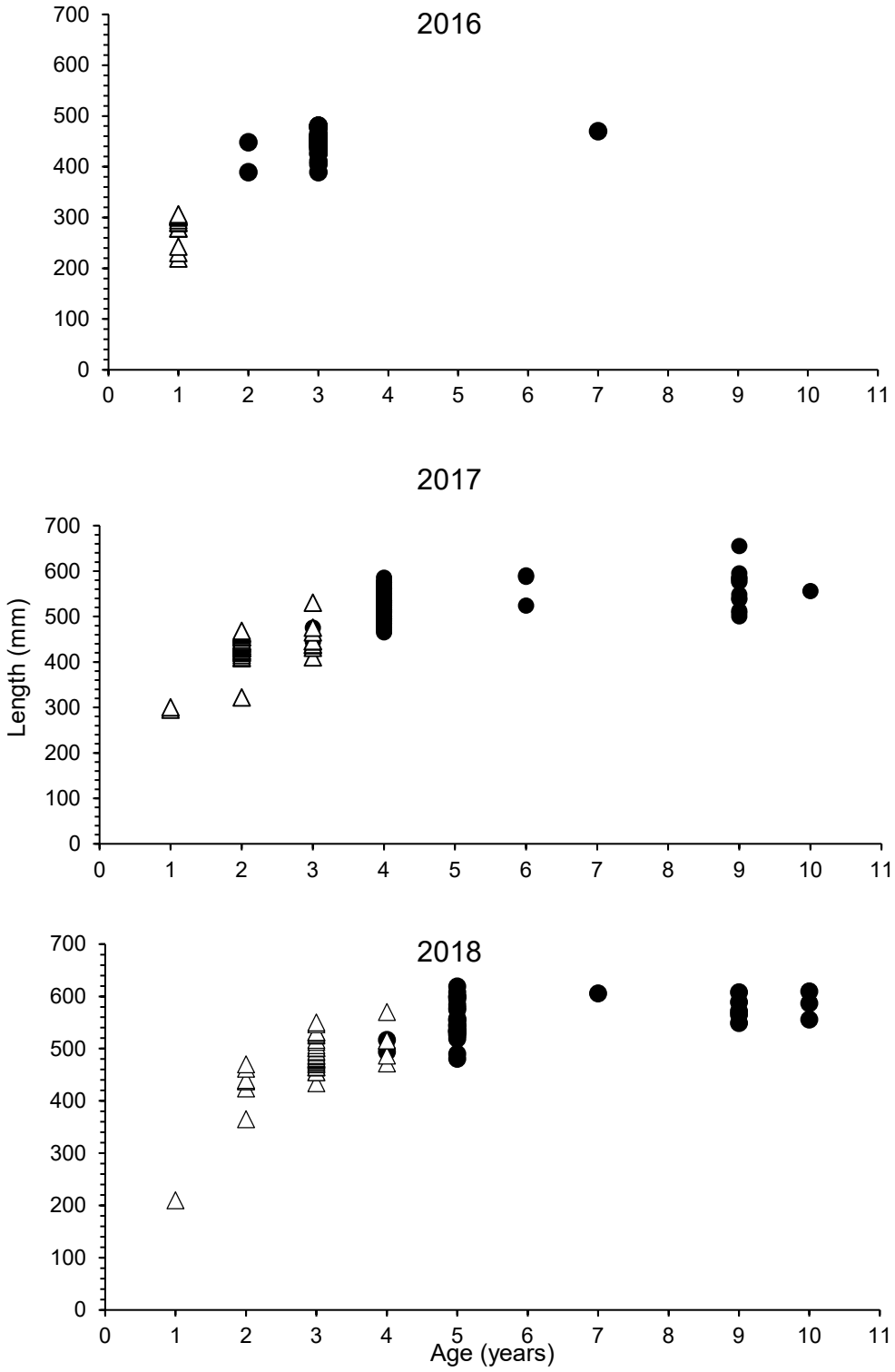
	Electrofishing		Trap Netting	
Species	N	CPUE	N	CPUE
Gizzard Shad	343	171.5 (15)		
Green Sunfish	19	9.5 (42)		
Warmouth	3	1.5 (73)		
Bluegill	532	266.0 (24)		
Longear Sunfish	107	53.5 (28)		
Redear Sunfish	7	3.5 (60)		
Largemouth Bass	149	74.5 (21)		
White Crappie			76	7.6 (36)

Appendix B. Map of sampling locations



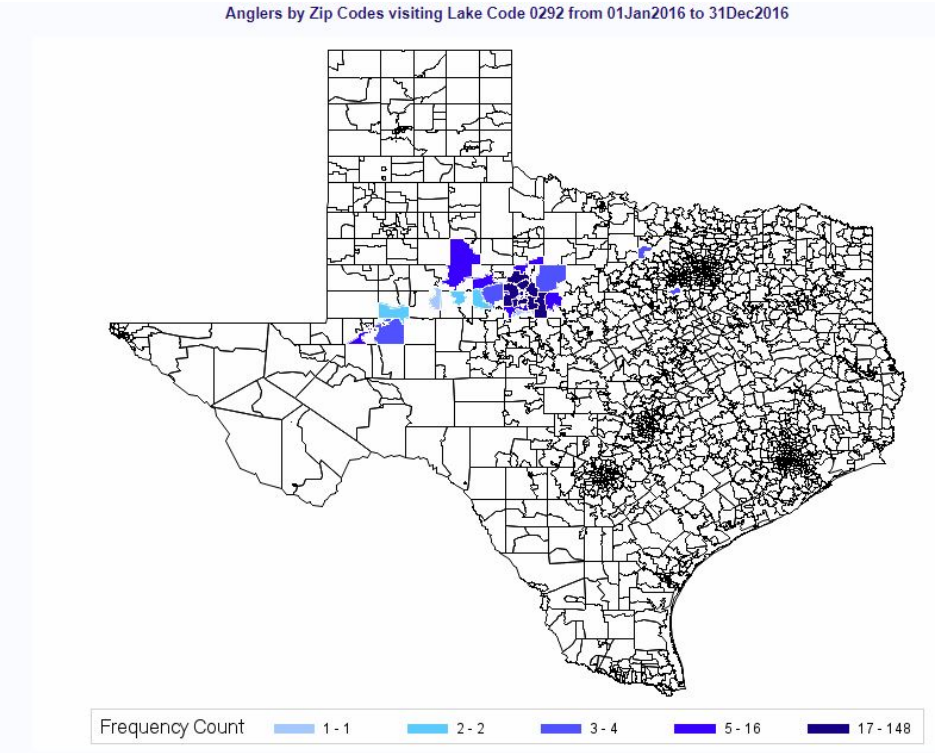
Map of electrofishing, trap netting, and gill netting stations at Fort Phantom Hill Reservoir, Texas, 2017-2019.

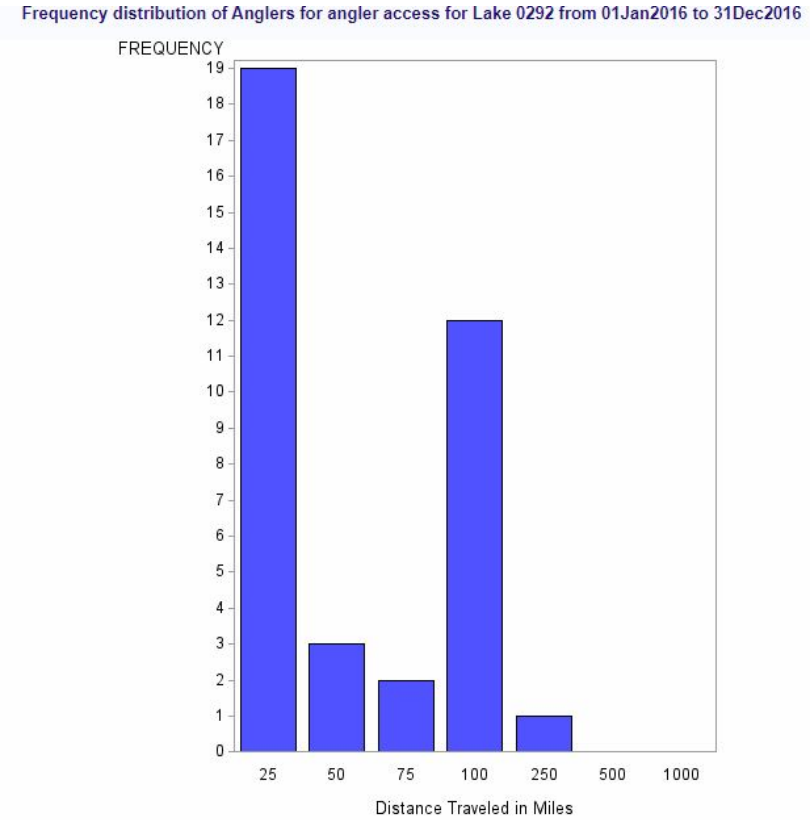
Appendix C. Age and growth of Hybrid Striped Bass



Length-at age distributions for Palmetto (circles) and Sunshine Bass (triangles) collected from spring gill netting surveys at Fort Phantom Hill Reservoir, Texas, 2016-2018.

Appendix D. Reporting of creel Zip Code data





Map of anglers by Zip Codes (top) and frequency distributions of miles traveled by anglers reported during the March 2016-February 2017 creel survey at Fort Phantom Hill Reservoir.

Life's better outside.®

In accordance with Texas State Depository Law, this publication is available at the Texas State Publications Clearinghouse and/or Texas Depository Libraries.