Fort Phantom Hill Reservoir

2023 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-5

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations were surveyed in fall 2021 and fall 2023 with electrofishing, gill netting and jug lining in spring 2022, and trap netting in fall 2023. A roving creel survey was conducted from December 1, 2021-November 30, 2022. Historical data are presented with the 2020-2024 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, 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. The reservoir is considered eutrophic. Water level substantially fluctuated from 2019 to 2024 (Figure 1). Multiple rain events from 2019-2021 increased water level to over conservation pool elevation. By spring 2024, the reservoir water level had decreased to 7 ft. below conservation pool elevation.

Management History: Important sport fish include hybrid striped bass, White Crappie, Largemouth Bass, and catfishes. White Bass are also present and are often targeted with hybrid Striped Bass. Stockings of hybrid Striped Bass were conducted annually from 2020-2024. Fish populations are managed with statewide harvest regulations.

Fish Community

- **Prey Species:** Gizzard Shad catch increased since 2019, and slightly over half appeared to be optimal prey size. Bluegill catch rates declined. Longear Sunfish catch was slightly higher than in 2019. Overall, relative abundance of prey species combined was lower than the 2019 survey but suitable to support existing sport fish populations.
- **Catfishes:** Blue Catfish were sampled 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 were present. Catfish harvest increased since the 2016-2017 creel, and angler effort increased towards this group.
- **Temperate Basses:** White Bass relative abundance fluctuated during the monitoring period, 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 of the legal fish were Sunshine Bass in gill netting surveys. Sunshine Bass aged at legal length had a mean age of 3.2 years old. Anglers reported releasing more legal White Bass and fewer legal hybrid striped bass.
- **Largemouth Bass:** Largemouth Bass relative abundance fluctuated in electrofishing surveys but catch rates of legal fish increased substantially. Body conditions were optimal. Mean age at legal length was 2.6 years old. Angling for Largemouth Bass was the most popular among anglers, and anglers reported releasing 96% of legal Largemouth Bass.
- **White Crappie:** White Crappie catch rate in trap net surveys fluctuated over the survey period. Crappie production appeared correlated with water level fluctuations. More legal length fish were observed in the 2023 trap netting survey compared to prior surveys. White Crappie angling effort decreased in the 2021-2022 creel survey. Anglers reported releasing slightly more legal fish.

Management Strategies: Continue to stock hybrid Striped Bass. Work with City of Abilene to improve angler access. Continue trap netting in fall 2025 and 2027 to monitor trends of White Crappie relative abundance. Biennial electrofishing will be conducted in fall 2025 and fall 2027. Gill netting will be conducted during spring 2028, and habitat and vegetation surveys will be conducted during summer 2027. Educate public about invasive species threats.

Introduction

This document is a summary of fisheries data collected from Fort Phantom Hill Reservoir during 2020-2024. 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 2020-2024 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 in the Brazos River Basin and is controlled by City of Abilene for municipal water supply and recreation uses. The reservoir is considered eutrophic and has a Carlson's Trophic State Index of 60.3 (Texas Commission on Environmental Quality 2024). Water level substantially fluctuated from 2019 to 2024 (Figure 1). Multiple rain events from 2019-2021 increased water level to over conservation pool elevation. By spring 2024, the reservoir water level had decreased to 7.0 ft below conservation pool elevation. 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 2019 to late spring 2024, three public ramps were accessible. Additional boat ramp characteristics are displayed in Table 2. Bank fishing access was available in various areas throughout the reservoir. One privately-operated pay-for-fishing dock and one public fishing dock were available.

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 14/acre. Conduct a study to evaluate growth, gear susceptibility, and angler catch between Palmetto and Sunshine Bass.

   Actions: Hybrid Striped Bass were stocked annually from 2021-2024. The special project data collection efforts were completed in 2023.

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 took place regarding needed improvements to access and closures. The City of Abilene submitted a proposal for Habitat and Angler Access Program funding in 2021, but the project did not receive funding. In spring 2024, a meeting with City of Abilene was conducted to discuss a master plan for Ft. Phantom Hill Reservoir that would include angler access improvements.

3. Conduct sampling biennially to monitor crappie at the reservoir.

   Action: Sampling for White Crappie was conducted in fall 2023 only. Man-power shortages associated with the COVID-19 pandemic in fall 2021 prevented sampling for crappie at the reservoir that year.

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 and updated at all Ft. Phantom Hill Reservoir public boat ramps. Several speaking points about invasive species were made during the monitoring period. 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. In 2021, the statewide regulations for Blue and Channel catfishes were changed to a no minimum length limit with no more than 10 fish ≥ 20 inches per day. 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. Sunshine Bass fingerlings were stocked in 2021-2024. Palmetto Bass fry were stocked in 2023. 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 2020). 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 2022).

Common names of fishes and their hybrids in this report are used following Page et al. (2023) with an exception for Largemouth Bass. While we recognize recent changes to black bass names, Texas reservoirs contain a mix of Florida Bass, Largemouth Bass, and their intergrade offspring. Therefore, Largemouth Bass is used in this report for simplicity as well as consistency with previous reports.

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by night-time electrofishing (2 hours at 24, 5-min stations). Electrofishing in 2023 was conducted using a Smith-Root Apex electrofisher, while previous surveys used GPP 7.5 electrofisher. 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 2023.

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.

Gill netting – White Bass, hybrid Striped Bass, Blue Catfish, and Channel Catfish were collected by gill netting (37 net nights at 37 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for Blue Catfish were determined by using otoliths collected from 191 fish, and

mean length at age was determined for cohorts represented in the sample. Ages for hybrid Striped Bass were determined using otoliths from 352 hybrids sampled in the survey, and mean length at age was determined for each cohort and hybrid type represented in the samples.

Jug lining – In 2022, Blue Catfish were collected by using paired jug lines at 97 random stations. Jug lines were equipped with two swiveling leaders with a single hook off the mainline as well as a bottom weight. Each pair had a jug line with 5/0 hooks and the other jug with 7/0 hooks baited with cut bait. Jug lines were deployed approximately 10-15 ft. apart overnight and then retrieved. The CPUE for jug lines was recorded as the number of fish caught per jug line pair (fish/jug line pair). Ages for Blue Catfish were determined using otoliths from 115 fish.

Genetics – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2022). Micro-satellite DNA analysis was used to determine genetic composition of individual fish since 2005 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 was 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 Neumann et al. (2012). TPWD has stocked both hybrid Striped Bass crosses (Palmetto Bass and Sunshine Bass) in the past. Most hybrid Striped Bass currently produced by TPWD hatcheries are sunshine bass. Even though PSD length categories and standard weight equation were developed based on Palmetto Bass populations, they are applied to Sunshine Bass under the assumption that there is little difference in the growth of the two hybrids. Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Creel survey – An annual roving creel survey was conducted from December 1, 2021 to November 30, 2022. Angler interviews were conducted ≥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 2022).

Habitat – A structural habitat and vegetation survey were conducted in summer 2023 by using the random point method (TPWD, Inland Fisheries Division, unpublished manual revised 2022). 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 (Kohn and Senyak 2024) for native and exotic plant species and structural habitat types.

Water level – Sources for water level data was the United States Geological Survey (USGS 2024).

Results and Discussion

Habitat: Habitat stations surveyed throughout the reservoir during summer 2023 were mostly open water and featureless (Table 6). Shoreline habitat consisted mostly of natural shoreline as well as sections with rocks, gravel, and boat docks (Table 7). Habitat features identified in other locations were primarily flooded terrestrial vegetation, buttonbush, and waterstargrass. Exotic salt cedar was present but with sparse coverage.

Creel: During the December 2021 – November 2022 roving creel survey, anglers spent an estimated 64,166 h fishing at Fort Phantom Hill Reservoir, and they reported about $486,662 in expenditures. About 40.7% of the reported fishing effort was from bank anglers and the remaining 59.3% of effort was reported from boat anglers. Approximately 35.0% of all angling effort was directed towards Largemouth Bass, whereas anglers also reported targeting catfishes (30.2%), hybrid Striped Bass and White Bass combined (12.2), targeting anything (12.1%), White Crappie (10.2), and Common Carp (0.3%). Anglers reported catching about 1.5 fish/h, of which approximately 0.6 fish/h were harvested, and 0.9 fish/h were released. Boat anglers were more successful in catching fish (2.7 fish/h) in comparison to bank anglers (1.0 fish/h). Overall, an estimated 129,989 fish were caught, of which 42,748 fish were harvested and the remaining 87,241 fish were estimated to have been released. Boat anglers had a slightly higher harvest rate (0.8 fish/h) than bank anglers (0.5 fish/h).

Prey Species: Gizzard Shad catch rates fluctuated from 450.4/h in 2015 and decreased to 171.5/h in fall 2019 than increased to 230.5/h in 2023 (Figure 2). The IOV for Gizzard Shad also declined substantially during the same period from 80 to 59, which indicated greater presence of larger (>8 inches TL) individuals that were not of desirable prey size. Bluegill total catch rates declined from 309.9/h in 2017 to 266.0/h in 2019, and to 148.5/h in 2023 (Figure 3). Similarly, catch rates of stock length Bluegill declined. Bluegill PSD increased from 4 in 2017 to 37 in TL 2023, which suggested that the size structure had a substantial increase of fish ≥ 6 inches TL. Longear Sunfish were also common, and their catch rates fluctuated from 100.9/h in 2017 to 53.5/h in 2019 to 60.5/h in 2023 (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 sampling issues as well as a decline in habitat availability because of drought.

Catfishes: Blue Catfish total catch rates in spring gill netting surveys fluctuated from 12.3/nn in 2017 to 23.2/nn in 2018 to 5.2/nn in 2022 (Figure 6). Catch of fish ≥ stock length (12 in TL) was lower than reported in 2017 (6.4/nn) and 2018 (7.5/nn). From 2017-2022, catch rates of fish ≥20 in TL were low (0.5-1.0/nn). The PSDs for Blue Catfish increased from 7 in 2017 to 13 in 2018 and to 20 in 2022. In 2022, Blue Catfish were caught at a rate of 1.2/jug line pair, and fish ranged 11-38 in TL (Figure 7). Mean age at stock length (i.e., 12 in TL) for Blue Catfish was approximately 6.0 years (N=43), and mean length at 20 in was about 12.8 years (see Appendix C).

Channel Catfish catch in gill netting surveys increased substantially from 0.9/nn in 2017 to 7.2/nn in 2022 (Figure 8). Catch of stock length Channel Catfish increased from 0.9/nn in 2017 to 3.4/nn in 2022. Body conditions of Channel Catfish were optimal and appeared to increase with body length. Flathead Catfish were also present in the reservoir.

In the 2021-2022 creel survey, anglers reported 16,205.7 h of directed effort towards Blue and Channel Catfish, which was lower than 28,691 h reported in the 2016-2017 creel survey (Table 9). Historically, most catfish effort is focused on Blue Catfish that are more abundant than other catfishes. Anglers reported 3,143.5 h of effort targeting Flathead Catfish. An estimated 4,831 Blue Catfish, 1,053 Channel Catfish, and 0 Flathead Catfish were harvested during the 2021-2022 creel period. Approximately 31% of legal Blue Catfish and 5% of legal Channel Catfish were released by anglers. A total of 39 Blue Catfish ranging from 12-24 in. TL and 12 Channel Catfish ranging 12-18 in. TL were observed harvested in the 2021-2022 creel survey (Figure 9).

White Bass: White Bass total catch rates in gill net surveys fluctuated from 3.0/nn in 2017 to 1.1/nn in 2018 to 13.0/nn in 2022; similar fluctuations were observed for the catch of fish ≥ stock length and legal fish (Figure 10). In 2022, catch rate of legal White Bass was substantially higher than those rates reported in 2017 (2.5/nn) and 2018 (1.0/nn). The size distribution was represented mostly by fish ≥12 in TL (PSD=79), and mean relative weights were mostly fair.

Anglers reported 7,818.6 h of effort targeting temperate basses, and an estimated 6,601 White Bass were harvested during the 2021-2022 creel period (Table 10). Effort targeting morones is likely more directed to hybrid Striped Bass, which are very popular at the reservoir as well, but anglers typically will catch and harvest both. Harvest is substantially higher than reported in the previous creel survey, and the percentage of released legal fish decreased from about 62% to 42% since the 2016-2017 creel survey. During the

2021-2022 creel survey, 53 White Bass were observed as harvested and ranged from 10-16 in. TL (Figure 11).

Hybrid Striped Bass: Hybrid Striped Bass catch rates in gill net surveys fluctuated from 12.0/nn in 2017 to 7.7/nn in 2018 to 8.6/nn in 2022 (Figure 11). Catch rates of legal length fish declined from 8.3/nn in 2017 to 6.9/nn in 2018 to 4.3/nn in 2022. The PSDs declined from 98 in both 2017 and 2018 to 58 in 2022; the PSD indicated that an increase of smaller sub-quality length fish were represented. Mean relative weights for most represented inch groups in the samples collected from 2016-2018 were fair (most being W_r>90), though several inch groups saw reductions in mean W_r. A total of 272 hybrid Striped Bass were retained for age and growth analysis, of which 63 fish were determined to be Palmetto Bass and the remaining 208 fish were Sunshine Bass (see Appendix D). No 18-in. TL Palmetto Bass were caught and retained for age and growth, though six 18-in. TL Sunshine Bass were caught and retained and had an average age of 3.2 years old (2017-year class). Only five trophy-length (i.e., 25-in.TL) Palmetto Bass were caught and retained and had an average age of 10 years old, whereas the 6 trophy length Sunshine Bass had an average age of 7.2 years old.

Angler effort towards targeting Morones declined in the 2021-2022 survey to 7,818.6 h of directed fishing effort from 8,091.3 h (Table 10). During the most recent creel, an estimated 7,135 hybrid Striped Bass were harvested, and 15,239 were released. Anglers reported 23% of the legal fish caught were released, which was substantially lower than reported in the 2016-2017 creel survey (68.0%). During the 2021-2022 creel survey, 60 hybrids were observed harvested and ranged from 18-26 in. TL (Figure 11).

Largemouth Bass: Since 2017, catch rates of Largemouth Bass have fluctuated from 59.3/h to 74.5/h in 2019 to 41.0/h in 2023 (Figure 13). Catch rates of stock length Largemouth Bass decreased from 47.3 in 2017 to 28.5/h in 2023. The catch rate of legal bass ($\geq$14-inches) fluctuated from 15.5 in 2017 to 12.5/h in 2019 to 20.0 in 2023. Largemouth Bass PSD fluctuated from 69 in 2017 to 56 in 2019 to 93 in 2023. The increase in PSD indicated there was more representation of fish greater than stock length in the 2022 survey, which may have been a result of sampling and/or lower reproduction by Largemouth Bass. Mean relative weights in each survey were mostly optimal (i.e., Wr ≥90) for the represented inch groups. Mean age at legal length was approximately 2.6 years old for fish collected in fall 2023 (Figure 14). Florida Largemouth Bass (FLMB) genetic influence has been variable, in which prevalence of FLMB alleles ranged from 41.4-61.9%, and prevalence of pure FLMB in samples ranged from 0.0-9.7. In the 2023 sample, all fish collected were intergrades, and the sample had 61% Florida Largemouth Bass alleles (Table 11). Overall, the Largemouth Bass population appeared to have ample legal-length fish with optimal body conditions available to anglers.

In the May 2021-2022 creel survey (Table 11), anglers spent an estimated 22,451.8 h of effort targeting Largemouth Bass, of which 8,465.4 h was from tournament anglers (Table 12). The amount of effort reported in the recent creel was substantially higher than reported in the 2016-2017 creel survey (4,605.7 h). In the 2021-2022 creel survey, combined angler CPUE increased from 0.4/h to 0.8/h since the 2016-2017 creel survey. Tournament angler CPUE was (1.5/h) higher than non-tournament anglers (0.5/h) in the 2021-2022 creel survey. In the 2021-2022 creel survey, the percent legal bass released by anglers was 96.3%, which was an increase since the 2016-2017 survey (87.2%). During the recent survey, 7 Largemouth Bass were observed harvested by anglers, and an estimated 9,201.4 fish were harvested (Figure 15).

White Crappie: White Crappie catch rates fluctuated from 10.9/nn in 2017 to 7.6/nn in 2019 to 17.8/nn in 2023 (Figure 16). Similarly, catch rates of stock length White Crappie fluctuated from 10.7/nn in 2017 to 6.6/nn by 2019 to 9.8/nn in 2023. Catch rates of legal White Crappie increased from 2.1/nn in 2017 to 3.0/nn in 2019 to 6.2/nn in 2023. Trends in catch of legal fish since 1996 have been variable (Figure 17). Since 2017, PSDs for the samples increased from 36 to 87, suggesting that more fish greater than stock length were represented in the size structure. The presence of several sub-stock length fish indicated good reproduction in the most recent survey. Mean relative weights for White Crappie in the three surveys were mostly optimal (W_r >90).

White Crappie angling popularity has declined since the 2016-2017 creel survey, anglers reported less hours of fishing effort in the 2021-2022 creel survey (6,565.3 h) than the 2016-2017 survey (14,609.9 h; Table 13). An estimated 2.8 fish/h of effort were caught during the 2021-2022 creel survey, and an

estimated 13,830.4 fish were harvested. The percentage of legal fish released slightly increased from 18.1% in the 2016-20217 survey to 19.2% in the 2021-2022 survey. During the 2021-2022 survey, 251 White Crappie were observed as harvested ranging from 10-16 inches (Figure 18).

Fisheries Management Plan for Fort Phantom Hill Reservoir, Texas

Prepared – April 2024

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 14 fingerlings/acre.
2. Continue to monitor growth between both Palmetto and Sunshine Bass that are stocked into the reservoir.

ISSUE 2: 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 lakebed.

MANAGEMENT STRATEGIES

1. Meet with City of Abilene to discuss bank access improvements for anglers at the reservoir.
2. Seek potential funding to create angler access improvements at the reservoir.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*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 (2024-2028)

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 Silversides and various minnows are also important forage species, but they have not been successfully captured with standardized gears used in the monitoring surveys.

Low-Density Fisheries: Flathead Catfish are present in the reservoir, but angling effort during the most recent creel surveys in 2016-2017 and 2021-2022 indicated that rod and reel angling effort is low. 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 2025 and 2027 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.

Catfishes: Catfishes support the second-most popular fishery (30% of overall effort) at the reservoir, and Blue Catfish are the most abundant. Historical monitoring of Blue Catfish has been achieved with both spring gill netting and low-frequency electrofishing. While low-frequency electrofishing has produced greater sample sizes, catch rates and PSDs have been variable. 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. Gill netting will be conducted once during the sample period, likely during spring 2028, by deploying 10 gill nets at randomly selected stations (Table 15). Additionally, if deemed feasible, spring jug lining will be conducted to increase sample size of fish >16 inches TL. Paired jug lines will be deployed at 50 randomly selected stations. A sample of ≥10 fish per inch group will be collected to assess growth of blue catfish during gill netting. 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 reasonable.

Channel Catfish catch in surveys has been achieved with gill net sampling and tandem hoop netting. Both gears have yielded low catch rates, which suggests that Channel Catfish abundance in the reservoir is low. However, monitoring of this species is necessary to provide status updates to anglers concerning the fishery as well as to determine if the fishery is being managed effectively. Channel Catfish will be sampled during spring gill netting in 2028. Relative abundance, size structure, and body conditions will be monitored without target levels of precision.

White Bass: White Bass are targeted by anglers also fishing for hybrid Striped Bass. Homer and Goldstrohm (2020) reported low directed fishing effort for White Bass, though the Morone fishery supports a popular group (12.2% of overall effort) that provides angling opportunities at the reservoir. Prior catch rates for White Bass had been low, but the 2022 survey had an increase in the number of fish sampled. Continuation of monitoring White Bass is recommended for the next survey period. Sampling will be conducted by gill netting in conjunction with sampling for hybrid Striped Bass and Blue Catfish. No target

levels of precision will be set for relative abundance, though a sample of ≥ 50 stock-length fish will be attempted to evaluate stock size. Relative weight may also be taken should ≥ 5 fish/inch group be obtained. A category II age sample will be conducted by sampling 13 fish, 9.0-10.9 inches TL. Additional sampling may be conducted should objectives for Blue Catfish or hybrid Striped Bass are not met.

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. Continuation of monitoring trends in size structure, body conditions, and age and growth are necessary to make management decisions for this fishery as well as to inform anglers on the status of the fishery. Traditionally, hybrid Striped Bass have been sampled with 10-20 gill nets. Sampling will be conducted with spring gill netting in 2028 by deploying 15 gill nets at random stations overnight. A target RSE≤30 will be attempted for CPUE-Total and Stock CPUE. Size structure will be evaluated by collecting a sample of ≥50 stock fish, and ≥5 fish/inch represented group will be weighed to evaluate relative weights. All hybrids will have scales collected to assess hybrid type. All dead hybrids will be retained for age and growth analysis. If objectives are not achieved, up to 10 additional stations may be sampled if deemed feasible.

Largemouth Bass: Largemouth Bass are relatively abundant in Fort Phantom Hill Reservoir and support the most popular fishery (35% overall effort). The reservoir had its first ShareLunker caught in 2024 at 13.3lbs, and the fishery has continued to attract anglers. Additional monitoring is required to determine trends in relative abundance, size structure, and body conditions to inform anglers about the status of the fishery and to ensure the fishery being managed effectively. To monitor Largemouth Bass and their prey, nighttime electrofishing surveys will be conducted in the fall 2025 and 2027 to maintain trend data for relative abundance (CPUE-Total, Stock CPUE, and CPUE-14), size structure, and body conditions. 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 conditions. An additional 6 stations of sampling will be conducted to meet objectives for Largemouth Bass if deemed feasible.

White Crappie: White Crappie support a popular sport fishery (10.2% overall effort) 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. 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 2025 and 2027 (Table 15). No target levels of precision will be attempted for relative abundance estimates. 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 either the 2025 or 2027 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 and June 1, 2021-May 31, 2022. A creel survey will not be conducted during this period.

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Tables and Figures

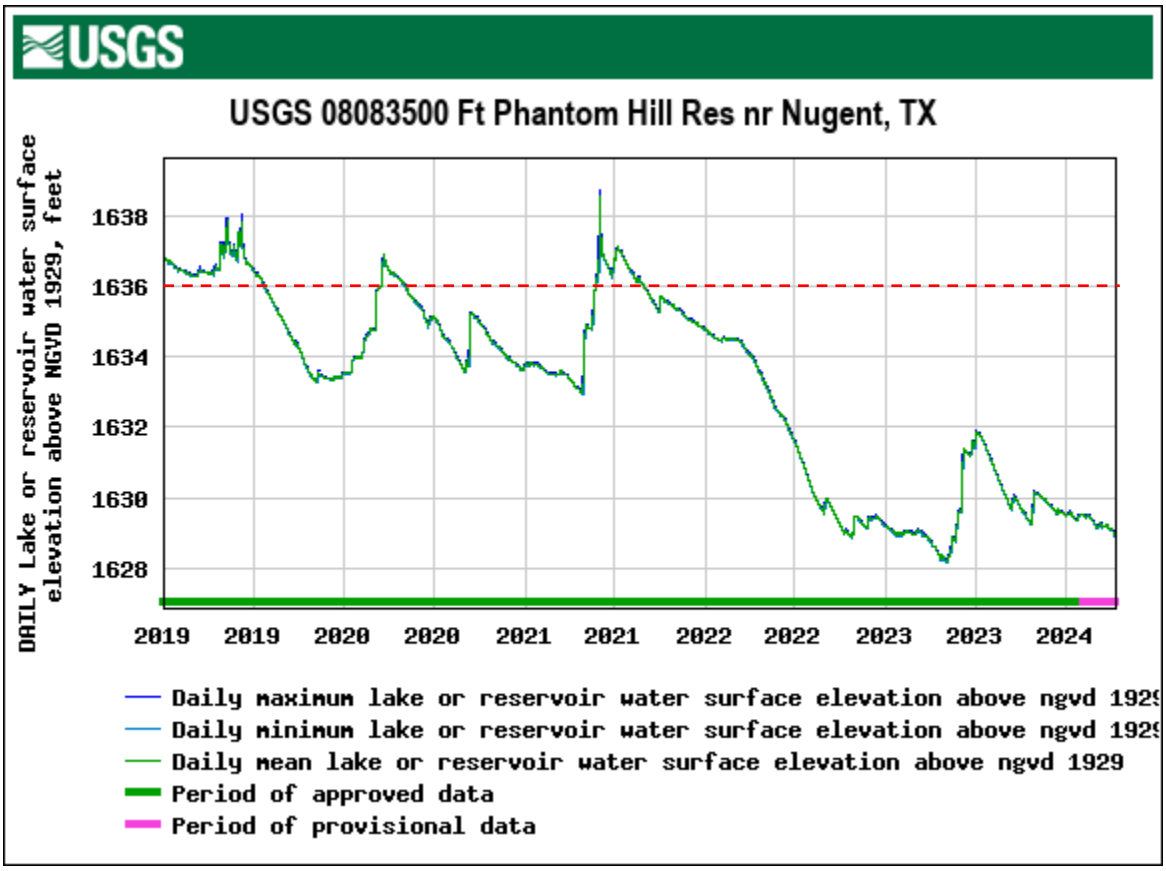


Figure 1. Daily water level elevations in feet above mean sea level (MSL) recorded for Fort Phantom Hill Reservoir, Texas, January 2019-April 2024 (USGS 2024). The dashed line indicates the conservation pool elevation.

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)
Carlson's Trophic State Index Chl-*a*	60.3 (Eutrophic)
Conservation Pool Elevation (ft. above mean sea level)	1,636
Bottom Pool Elevation (ft. above mean sea level)	1,582
Conductivity	572-980 µS/cm

Table 2. Boat ramp characteristics for Fort Phantom Hill Reservoir, Texas, April 2024. Reservoir elevation at time of survey was 7 ft. below 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	Inaccessible
White Elephant/ East Dam Ramp	32.615709º -99.666595º	Y	10	2	1,621	Inaccessible
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	Inaccessible

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; 10 ≥ 20 inches (in any combination)	No 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
	2023	306,548	FRY
	Total	2,040,728	
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
	2021	70,450	FGL
	2022	97,002	FGL
	2022	299,590	FRY
	2023	42,828	FGL
	2024	62,645	FGL
	Total	977,820	
Largemouth Bass	1973	2,500	UNK

Table 4. continued

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	
ShareLunker Largemouth Bass	2024	20,615	FGL
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 2020–2024.

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
Gill netting			
Hybrid Striped Bass	Relative Abundance	CPUE-Total, Stock-CPUE	RSE ≤ 25
	Size Structure	PSD, Length frequency	N ≥ 200 stock
	Body Condition	W_r	10 fish/inch group
	Age and Growth	Age frequency	All hybrids collected
	Genetics	Determination of hybrid type	Scales from all hybrids
Blue Catfish	Relative Abundance	CPUE-Total, Stock-CPUE	RSE ≤ 25
	Size Structure	PSD, Length frequency	N ≥ 200 stock
	Body Condition	W_r	10 fish/inch group
	Age and Growth	Age frequency	Otoliths from all fish
Channel Catfish	Relative Abundance	CPUE-Total, Stock-CPUE	Practical effort
	Size Structure	PSD, Length frequency	N ≥ 200 stock
	Body Condition	W_r	10 fish/inch group
Jug lining			
Blue Catfish	Relative Abundance	CPUE-Total, Stock-CPUE	Practical effort
	Size Structure	PSD, Length frequency	N ≥ 50 stock
	Body Condition	W_r	10 fish/inch group
	Age and Growth	Age frequency	Otoliths from all fish

Table 6. Percent (%) occurrence and associated 95% confidence intervals (parentheses) for vegetation throughout the reservoir encountered during the summer 2023 habitat survey (371 points), Fort Phantom Hill Reservoir, Texas. Water level at time of survey was approximately 5 ft. below conservation pool level.

Habitat Type	Percent Occurrence	LCL	UCL
Open Water	52.6	47.3	57.7
Flooded Terrestrial Vegetation	9.4	6.5	12.4
Native Emergent Vegetation	8.9	6.0	11.8
Native Floating-leaved Vegetation	1.3	0.1	2.5
Native Submerged Vegetation	0.3	0.0	0.8

Table 7. Percent (%) occurrence and associated 95% confidence intervals (parentheses) for habitat and vegetation types along the reservoir shoreline (215 points) encountered during the summer 2023 vegetation survey, Fort Phantom Hill Reservoir, Texas. Water level at time of survey was approximately 5 ft. below conservation pool level.

Habitat type	% Shoreline	LCL	UCL
Rocky Shoreline	44.2	37.6	50.8
Natural Shoreline	36.3	29.9	42.7
Docks and Piers	16.3	11.3	21.2
Gravel Shoreline	15.3	10.5	20.2
Bulkhead	4.2	1.5	6.9
Native Emergent Vegetation	76.3	70.6	82.0
Flooded Terrestrial Vegetation	15.3	10.5	20.2
Standing Timber	3.7	1.2	6.3

Table 8. Directed effort (hours), relative standard error in parentheses, percent of overall effort by species group, and total angler expenditures reported in the March 1, 2016 – February 28, 2017 and December 1, 2021 – November 30, 2022, roving creel surveys, Fort Phantom Hill Reservoir, Texas.

	2016/2017			2021/2022		
Species Group	Effort (hours)	Percent of Overall Effort (%)	Expenditures ($)	Effort (hours)	Percent of Overall Effort (%)	Expenditures ($)
Largemouth Bass	4,605.7 (23)	5.8		22,451.8 (22)	35.0	
Blue and Channel Catfishes	28,691.2 (15)	36.2		19,349.2 (18)	30.2	
Temperate (Morone) Basses	8,194.0 (18)	10.3		7,818.6 (24)	12.2	
Anything	21,641.6 (15)	27.3		7,759.5 (22)	12.1	
Crappie	14,609.9 (16)	18.5		6,565.3 (22)	10.2	
Flathead Catfish	0.0 (0)	0.0		3,143.6 (43)	4.9	
Sunfish	333.9 (87)	<0.1		221.3 (108)	0.3	
Total Expenditures			$1,369,604 (235)			$486,662 (57)

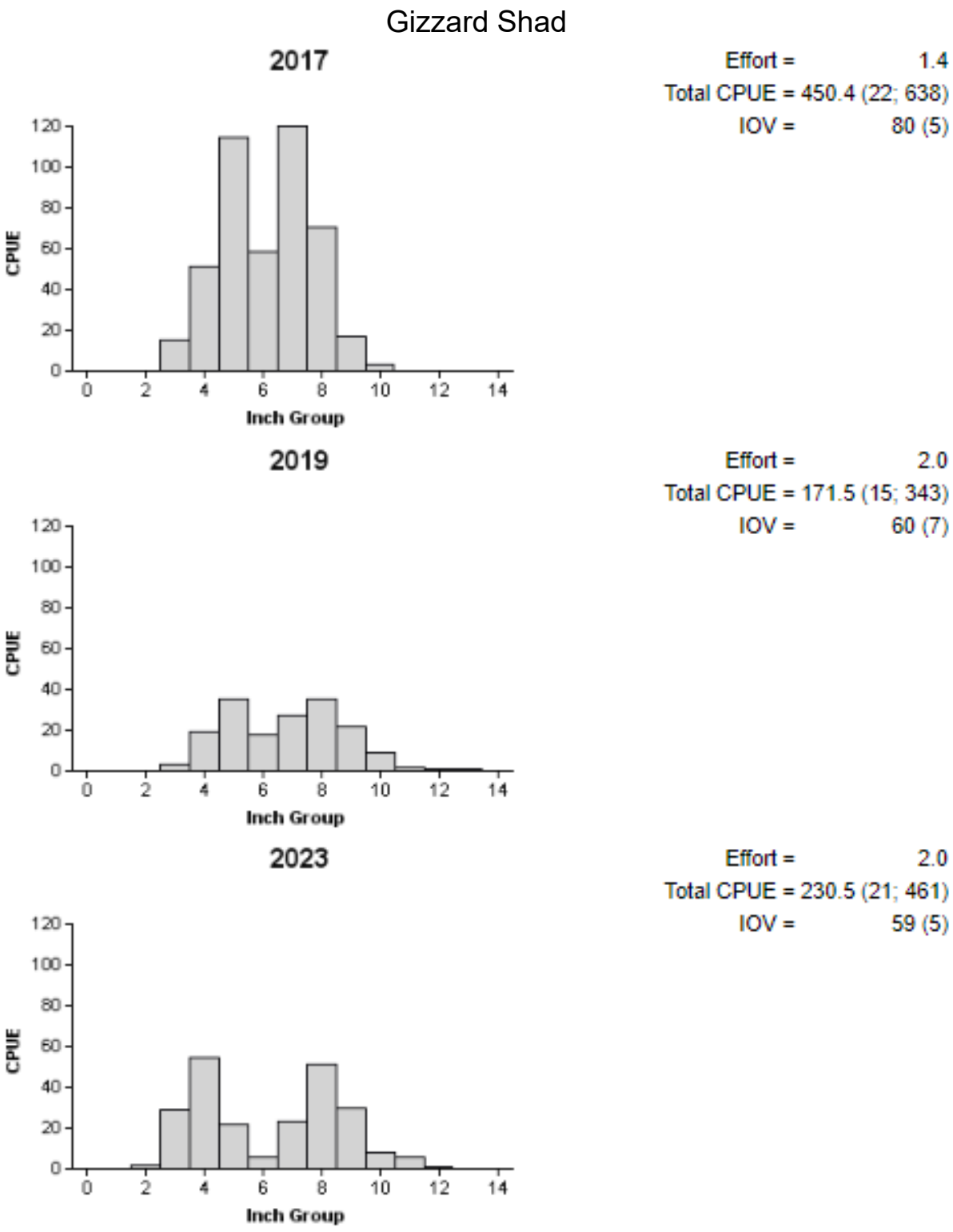
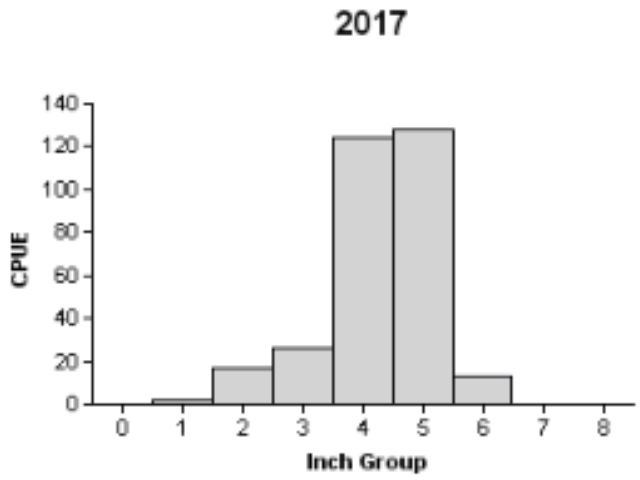
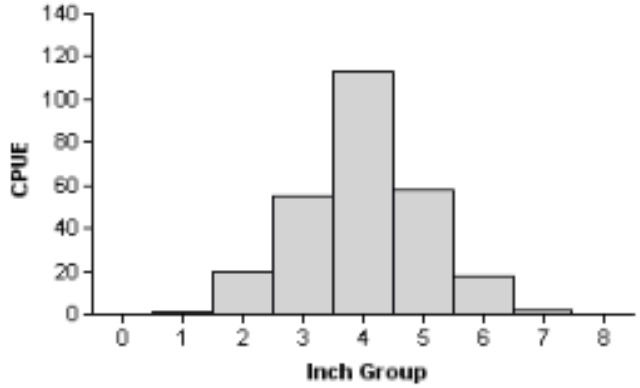


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2019, and 2023.

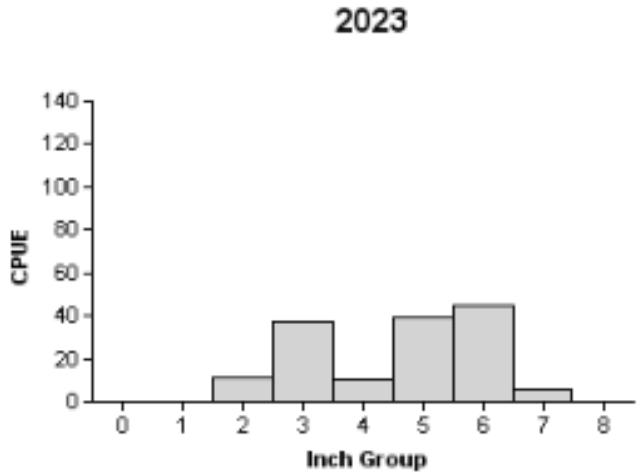
Bluegill



Effort = 1.4
Total CPUE = 309.9 (18; 439)
Stock CPUE = 290.8 (19; 412)
PSD = 4 (2)



Effort = 2.0
Total CPUE = 266.0 (24; 532)
Stock CPUE = 245.5 (24; 491)
PSD = 8 (2)



Effort = 2.0
Total CPUE = 148.5 (20; 297)
Stock CPUE = 137.5 (22; 275)
PSD = 37 (4)

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, 2017, 2019, and 2023.

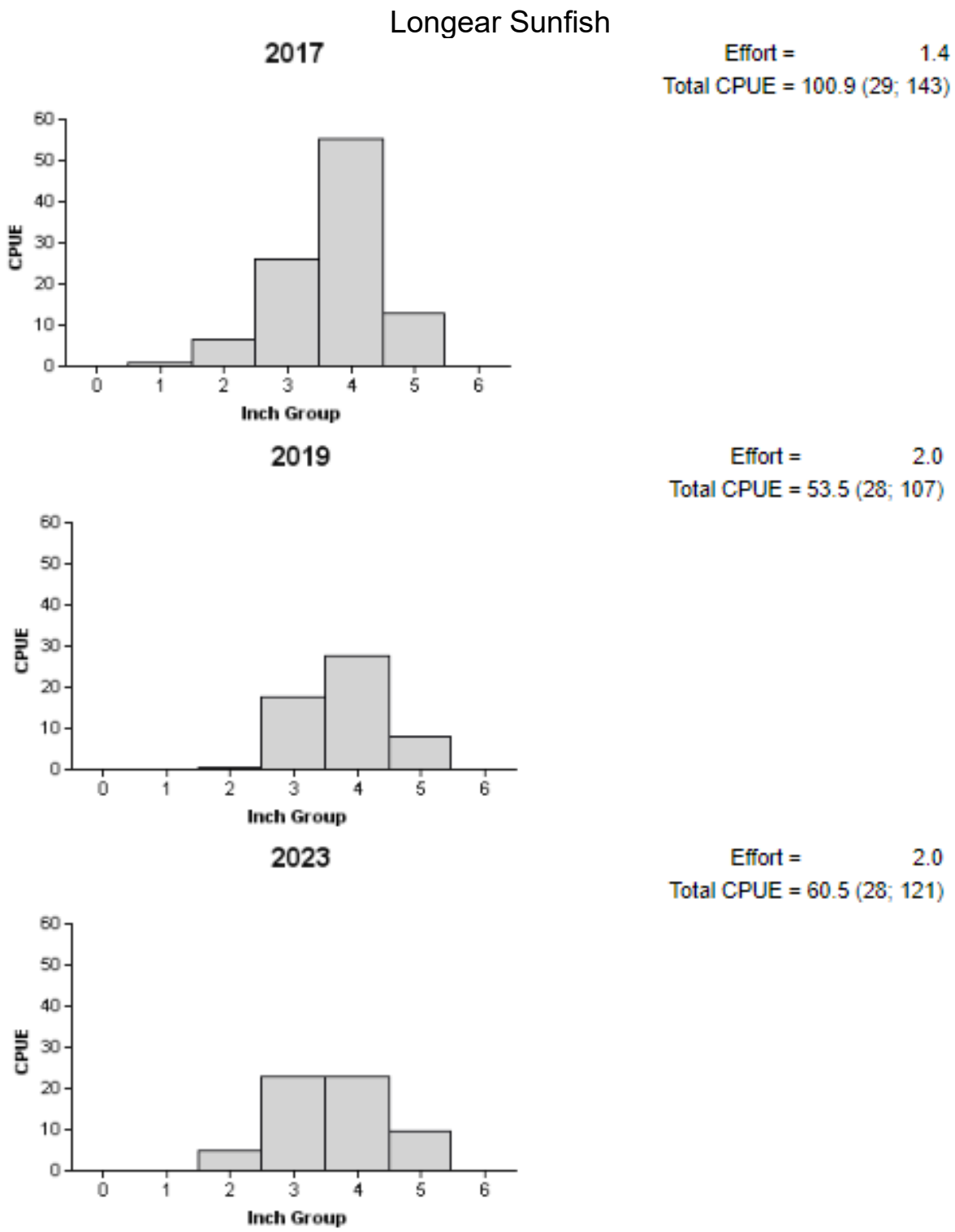


Figure 4. Number of Longear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2019, and 2023.

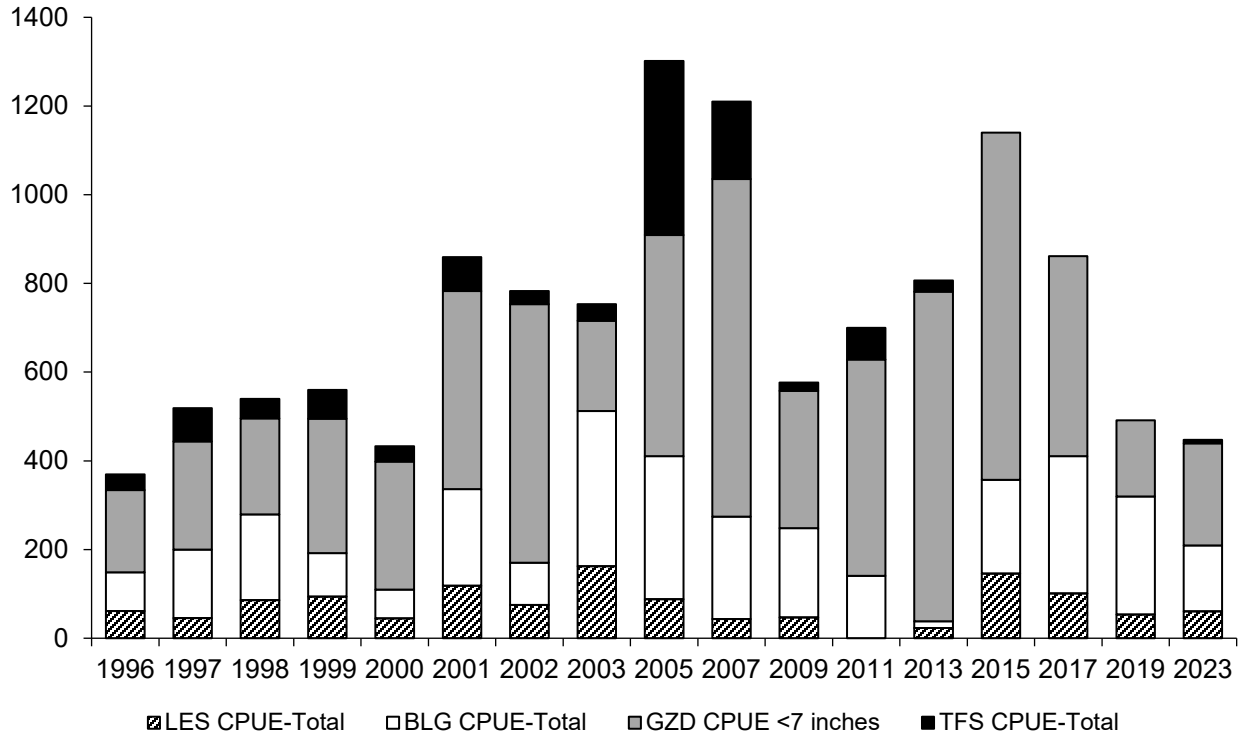


Figure 5. Trends in cumulative catch per unit effort (CPUE; fish/h) for the four most sampleable and common prey species, Threadfin Shad (TFS), Gizzard Shad (GZD), Bluegill (BLG), and Longear Sunfish (LES) observed during fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 1996-2023.

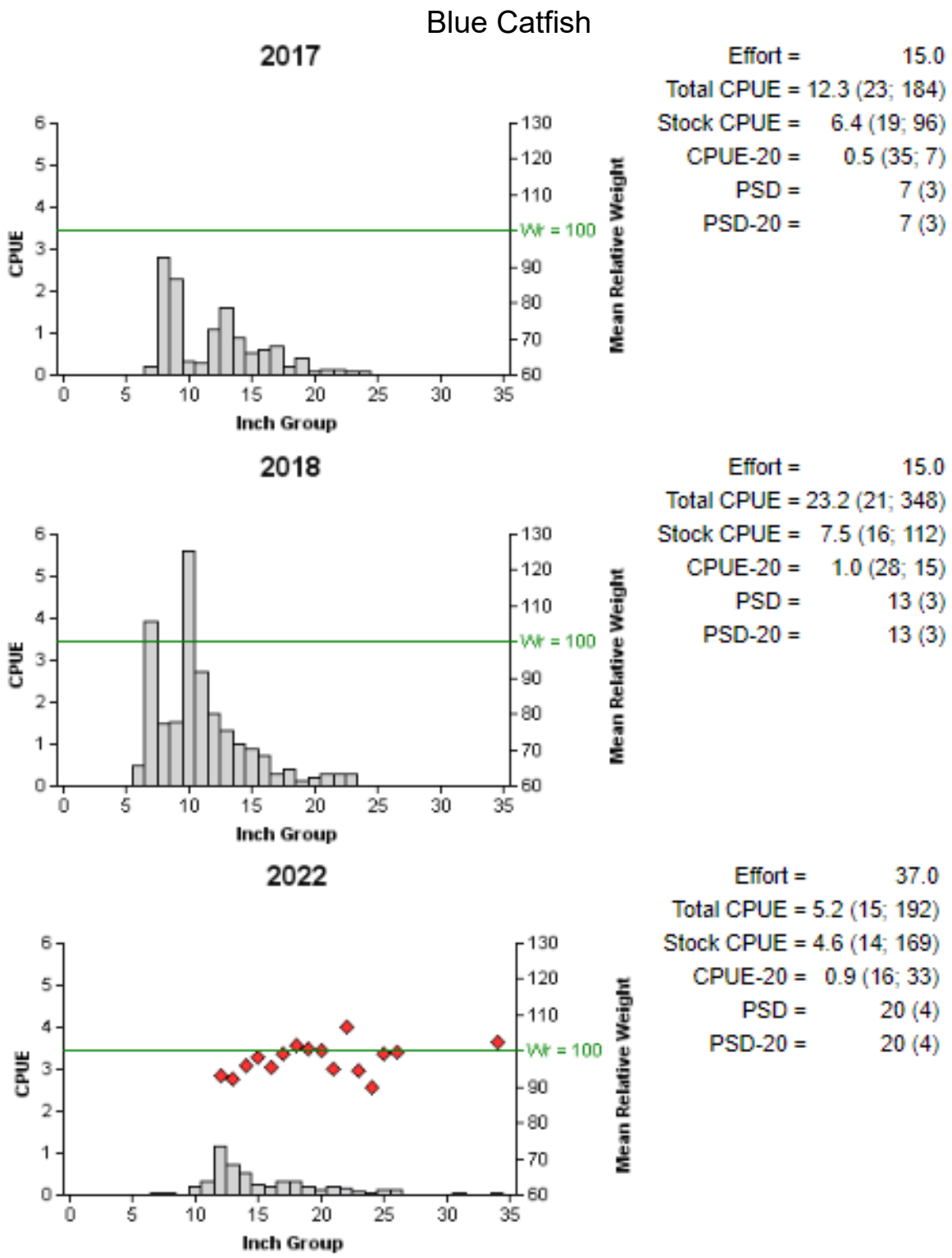


Figure 6. Number of Blue Catfish caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2018, and 2022. The horizontal line indicates the mean relative weight at 100.

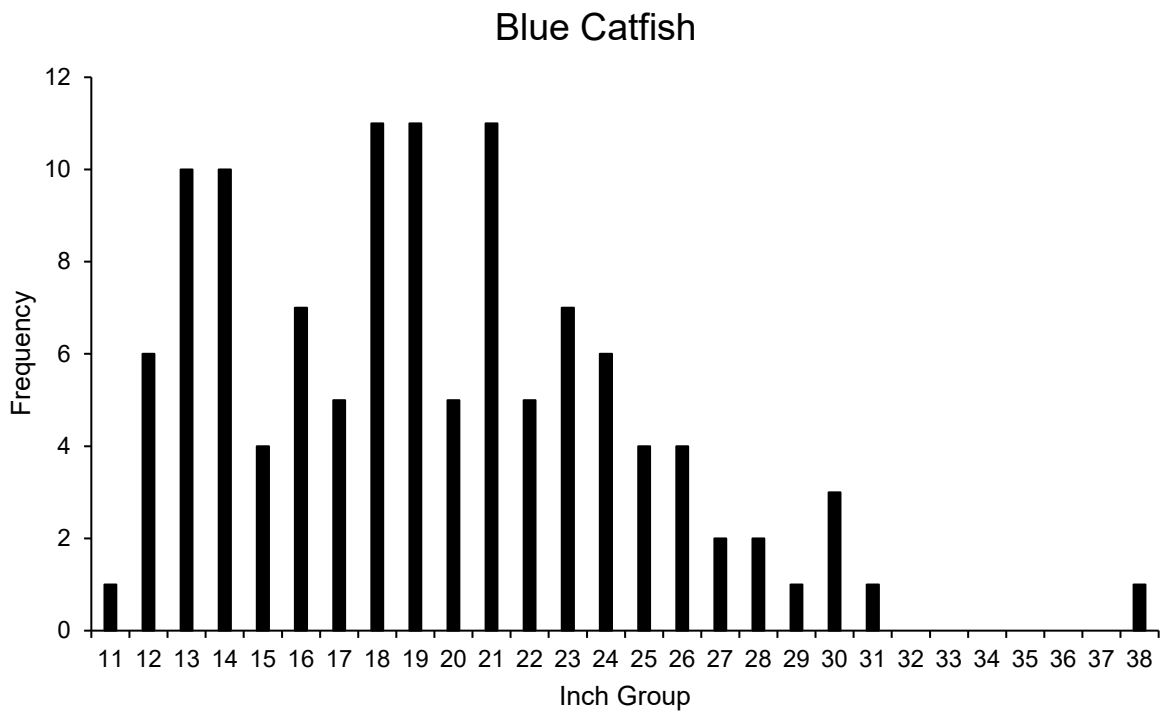


Figure 7. Length frequency distribution of Blue Catfish (N=117) caught during the spring 2022 jug lining survey, Fort Phantom Hill Reservoir, Texas. Sampling effort was 97 jug pairs.

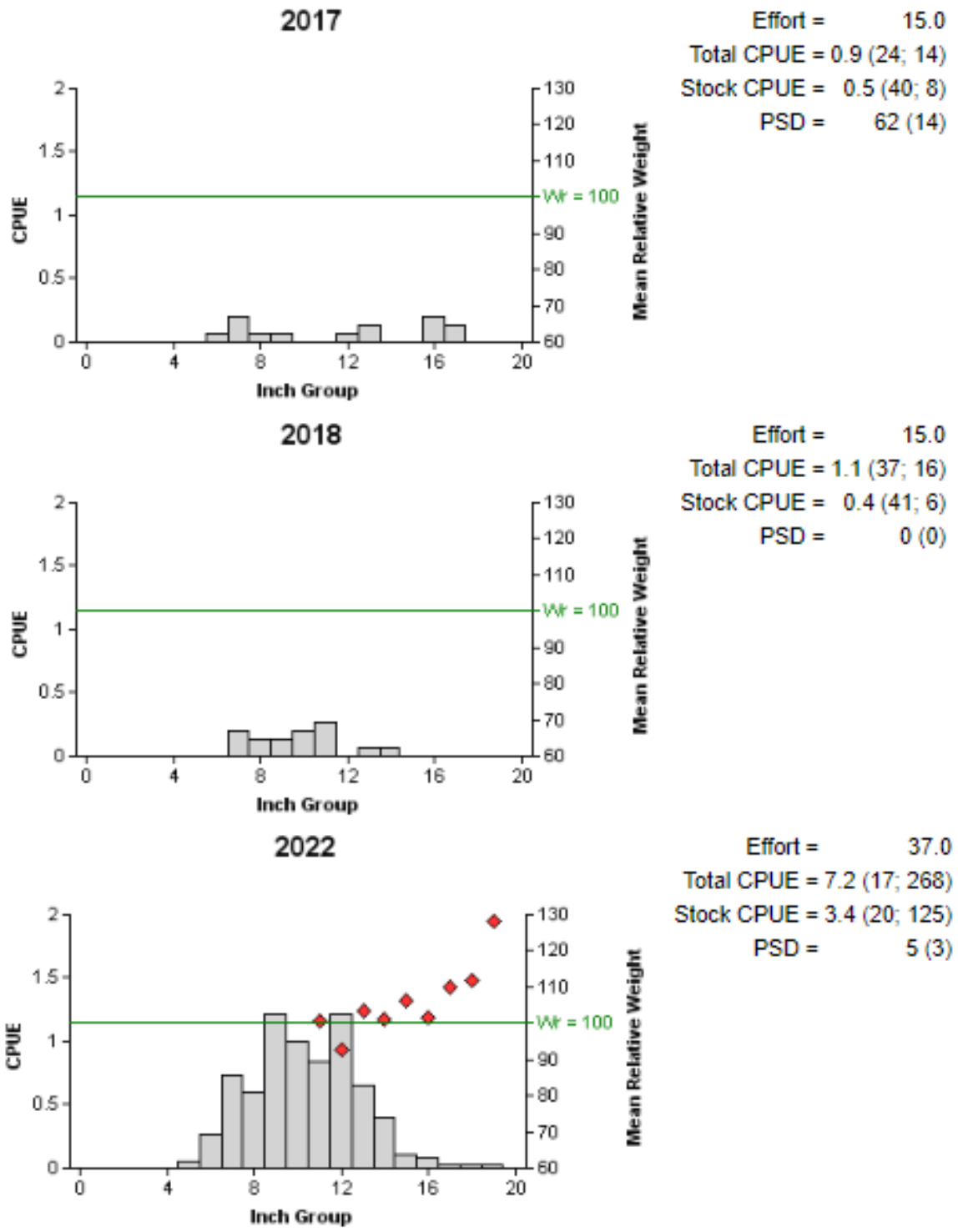


Figure 8. Number of Channel Catfish caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2018, and 2022. The horizontal line indicates the mean relative weight at 100.

Catfishes

Table 9. Creel survey statistics for catfishes at Fort Phantom Hill Reservoir, Texas, from March 1, 2016-February 2017, and December 1, 2021-November 2022. 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	Survey Year	
	2016/2017	2021/2022
Surface area (acres)	4,246	4,246
Directed effort (h)	28,691.2 (16)	16,205.7 (18)
Directed effort/acre	6.76 (16)	3.8
Total catch per hour	0.3 (35)	0.2 (61)
Total harvest	3,412.6	5,884.0
Blue Catfish	3,089.3 (42)	4,830.7 (71)
Channel Catfish	323.3 (113)	1,053.3 (111)
Harvest/acre	0.6 (58)	1.4
Blue Catfish	0.6	1.1
Channel Catfish	0.1	0.2
Percent legal released	63.3	36.1
Blue Catfish	59.1	31.0
Channel Catfish	56.0	5.1

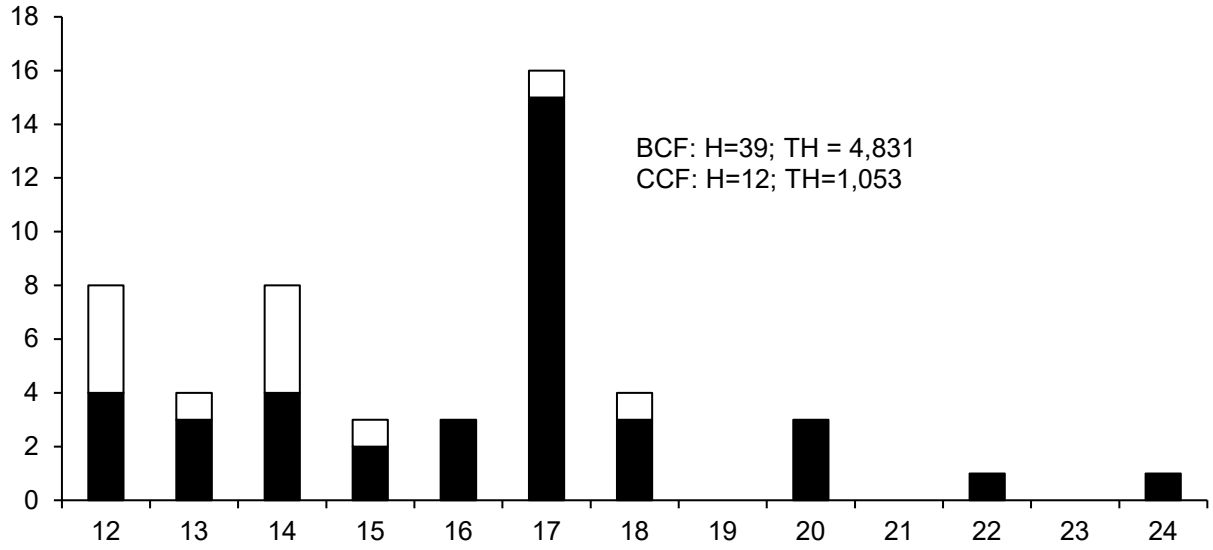


Figure 9. Length frequency of harvested Blue (black bars) and Channel Catfish (white bars) by all anglers combined observed during the 2021-2022 creel survey at Fort Phantom Hill Reservoir, Texas. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

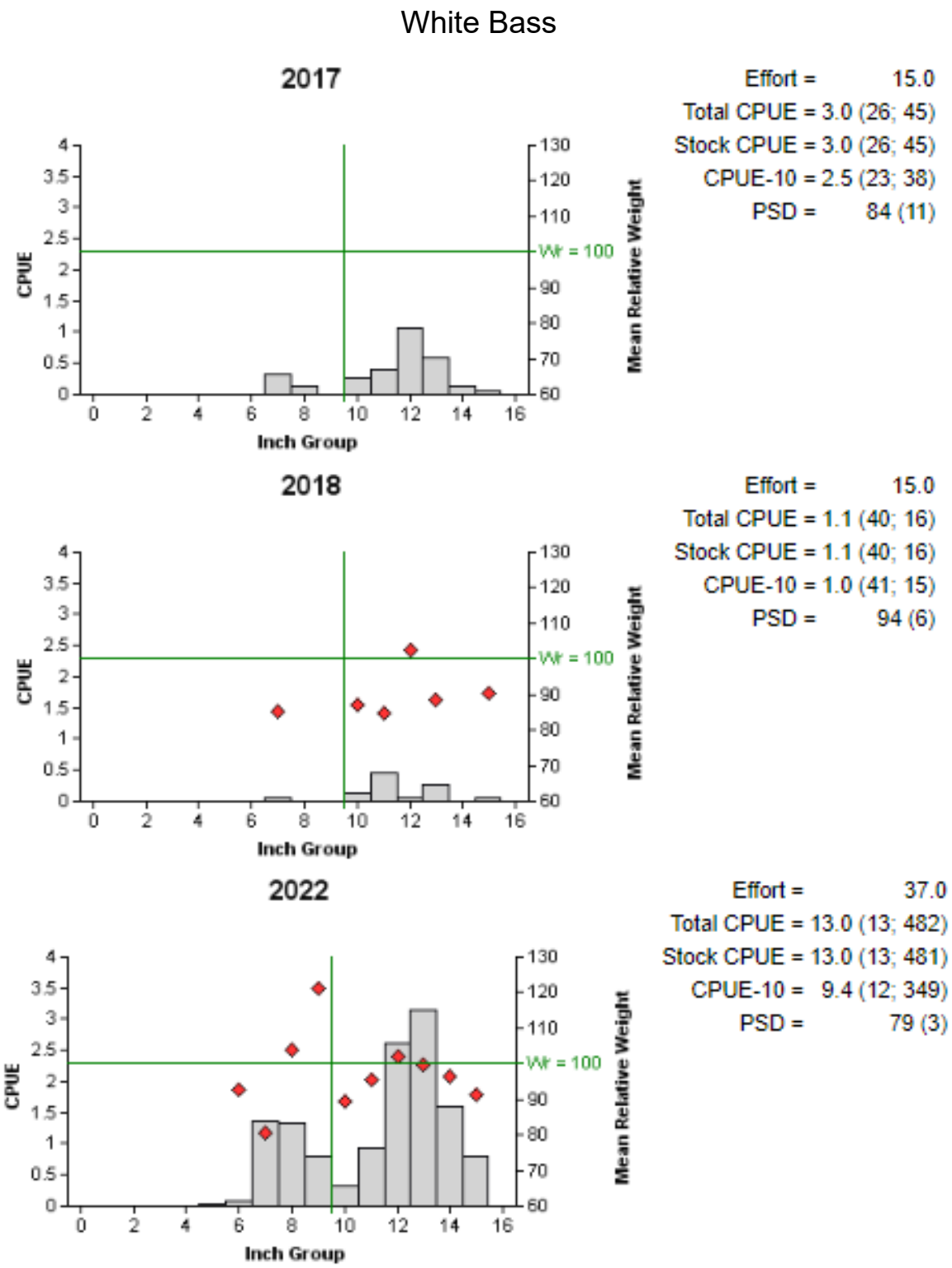


Figure 10. Number of White Bass caught per net night (CPUE), population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weight (diamonds) for spring gill netting surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2018, and 2022. Vertical line represents the 10-in. minimum length limit, and the horizontal line represents the relative weight = 100.

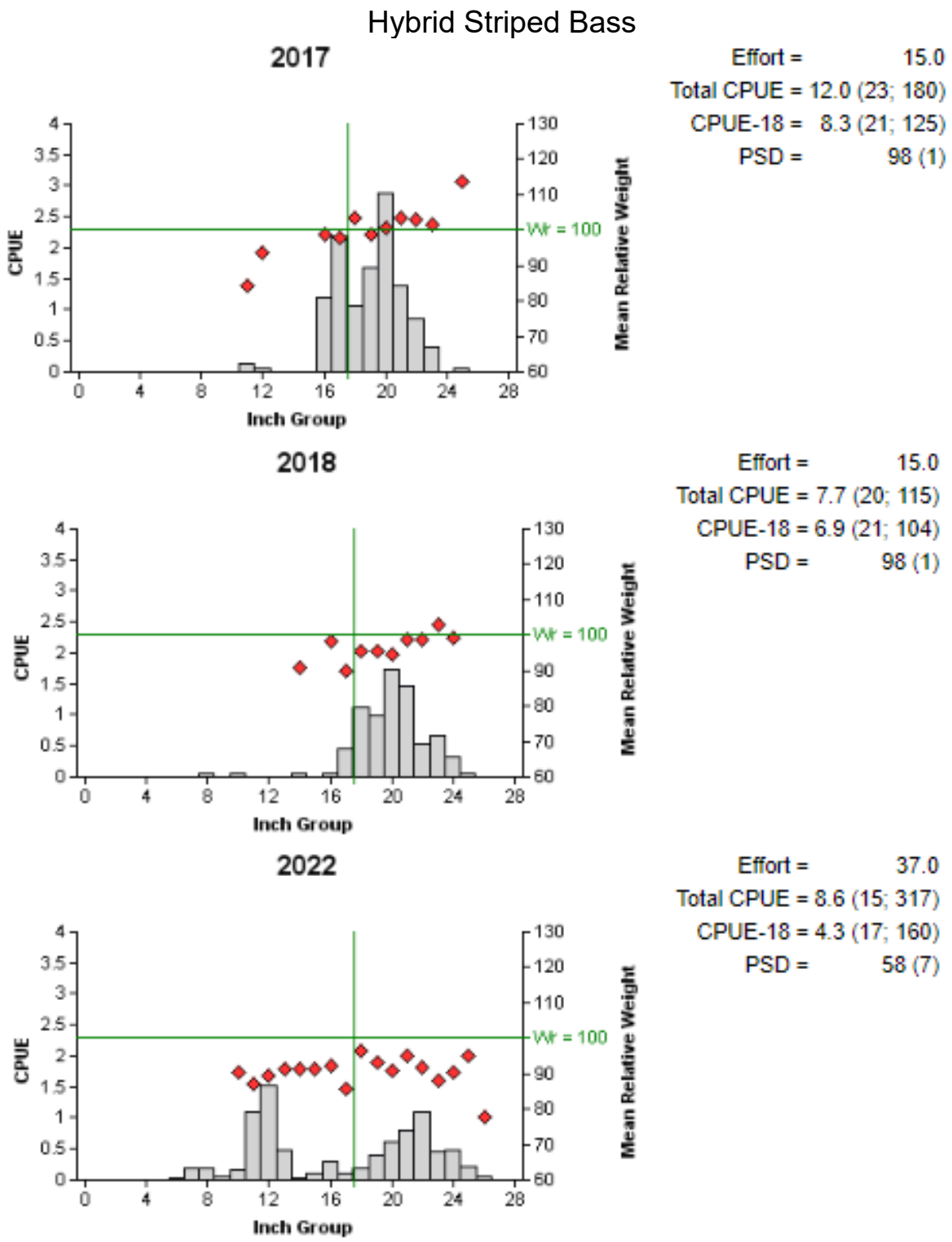


Figure 11. Number of hybrid Striped Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weights by inch group (diamonds) for spring gill netting surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2018, and 2022. Vertical line denotes the 18-in minimum length limit, and the horizontal line represents the relative weight = 100.

Morones

Table 10. Creel survey statistics for White Bass and hybrid Striped Bass at Fort Phantom Hill Reservoir, Texas, from March 2016- February 2017, and December 2021-November 2022. Total catch per hour is for anglers targeting morones and total harvest is the estimated number of individuals harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year	
	2016/2017	2021-2022
Surface area (acres)	4,246	4,246
Directed effort (h)	8,091.3 (19)	7,818.6 (24)
Directed effort/acre	1.9 (20)	1.8 (24)
Total catch per hour	0.5 (69)	2.8 (48)
Total harvest	881.9 (47)	13,736.1 (63)
White Bass	163.5 (47)	6,601.2 (61)
Hybrid Striped Bass	718.4 (64)	7,134.9 (67)
Harvest/acre	20.8 (47)	3.2 (63)
White Bass		1.5 (61)
Hybrid Striped Bass		1.7 (67)
Percent legal released		
White Bass	61.6	41.6
Hybrid Striped Bass	68.0	22.7

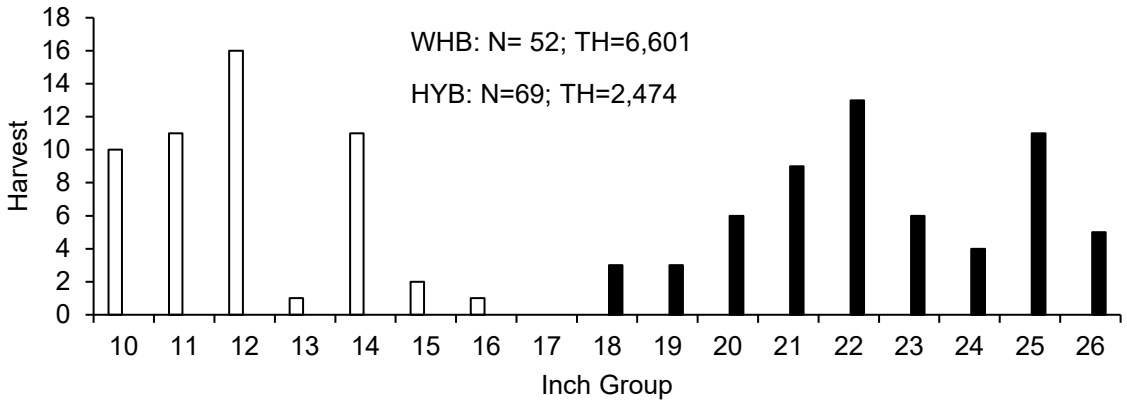


Figure 12. Length frequency of harvested White Bass (WHB; white bars) and hybrid Striped Bass (HYB; black bars) by all anglers combined observed during the 2021-2022 creel survey at Fort Phantom Hill Reservoir, Texas, N is the number of harvested fish observed during creel surveys, and TH is the total estimated harvest for the creel period.

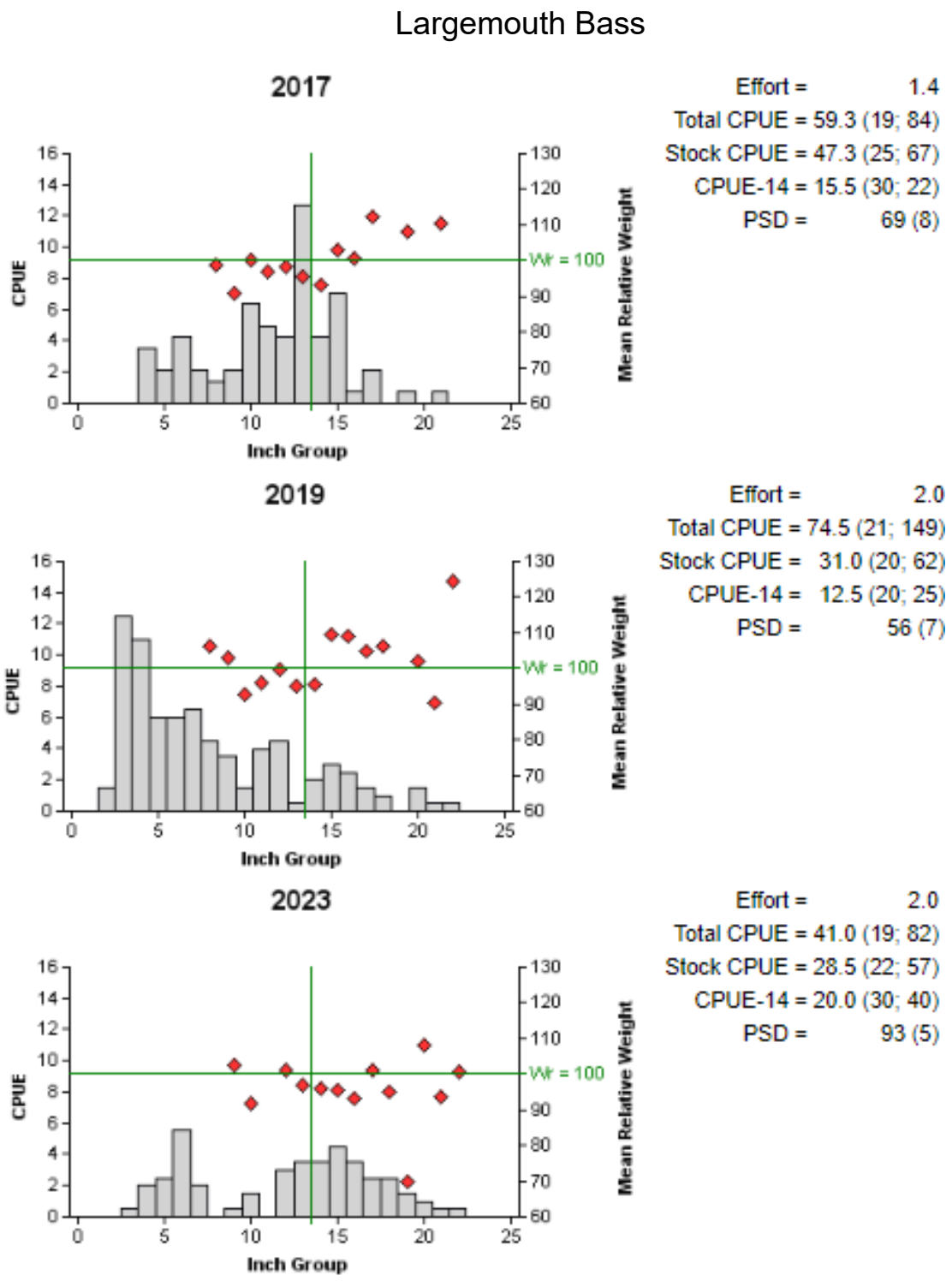


Figure 13. Number of Largemouth Bass caught per hour (CPUE), population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weights (diamonds) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2019, and 2023. Vertical line denotes the 14-in minimum length limit, and the horizontal line represents the relative weight = 100.

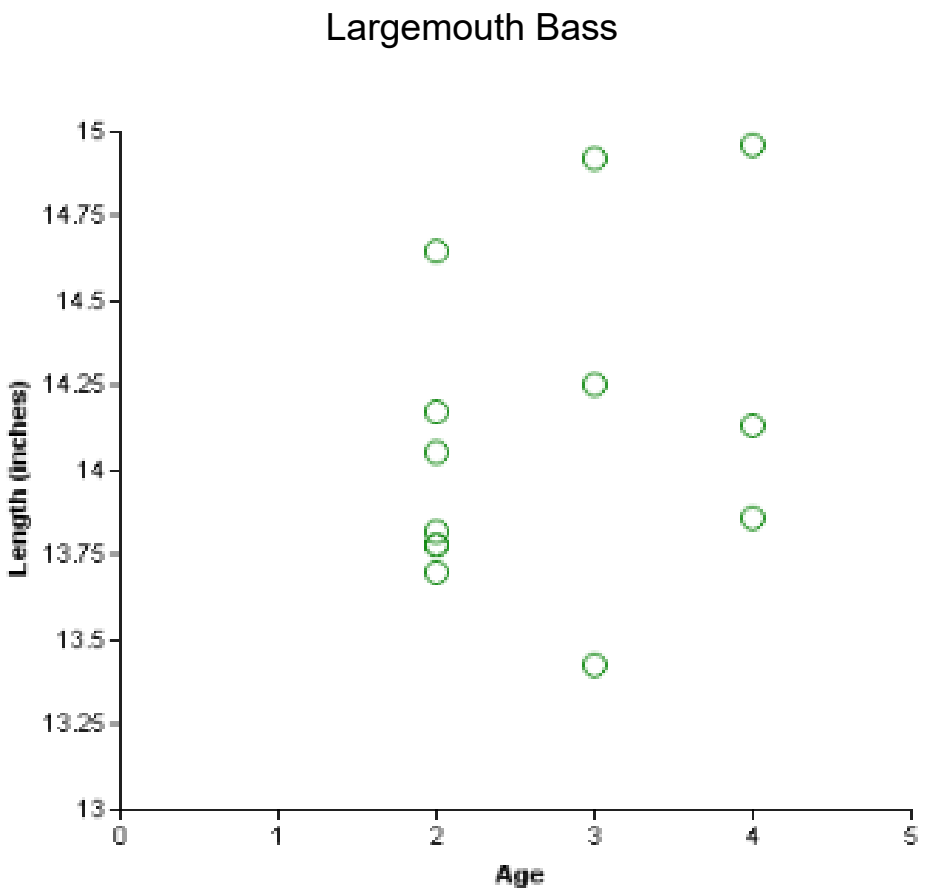


Figure 14. Age distribution of Largemouth Bass 13.0-14.9 inches TL collected during fall 2023 electrofishing, Ft. Phantom Hill Reservoir, Texas.

Table 11. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Fort Phantom Hill Reservoir, Texas, 1998-2023. 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
2023	30	0	30	0	61.0	0.0

Largemouth Bass

Table 12. Creel survey statistics for Largemouth Bass at Fort Phantom Hill Reservoir, Texas, from March 2016-February 2017 and December 2021-November 2022. 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. Tournament anglers were not reported in the 2016-2017 creel survey.

Creel survey statistic	Year	
	2016/2017	2021/2022
Surface area (acres)	4,246	4,246
Directed effort (h)	4,605.7 (23)	22,451.8 (22)
Non-tournament		13,966.5 (22)
Tournament		8,465.4 (34)
Directed effort/acre	1.1 (23)	5.3 (22)
Non-tournament		3.3 (22)
Tournament		2.0 (34)
Total catch per hour	0.4 (44)	0.8 (58)
Non-tournament		0.5 (32)
Tournament		1.5 (60)
Total harvest	29.1 (157)	9,201.4 (84)
Harvest/acre	<0.1 (157)	2.2 (84)
Percent legal released (Non-tournament anglers)	87.2	96.3

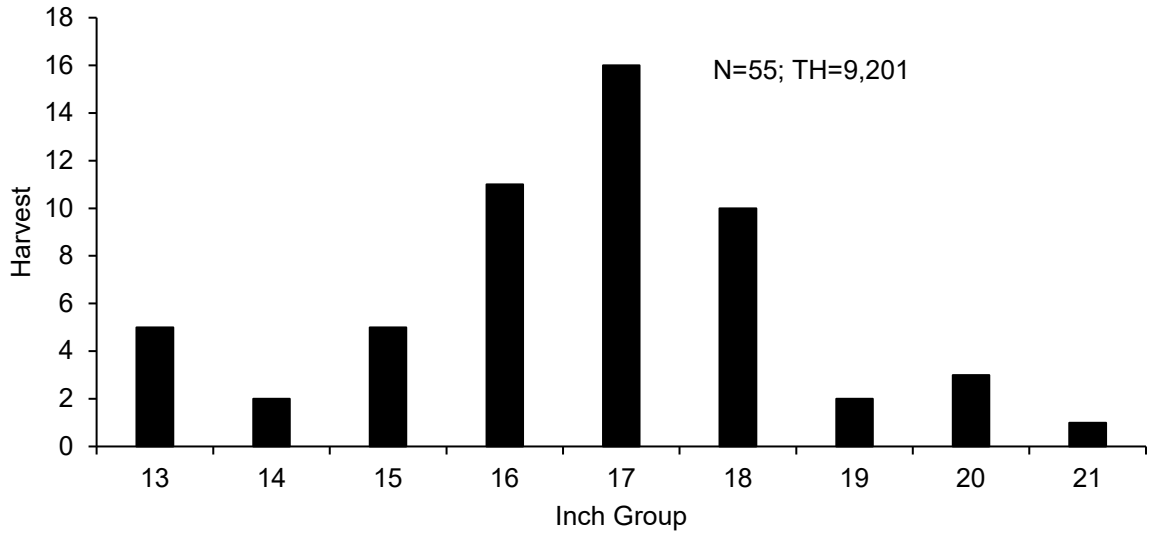


Figure 15. Length frequency of harvested Largemouth Bass by all anglers combined observed during the 2021-2022 creel survey at Fort Phantom Hill Reservoir, Texas. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Crappie

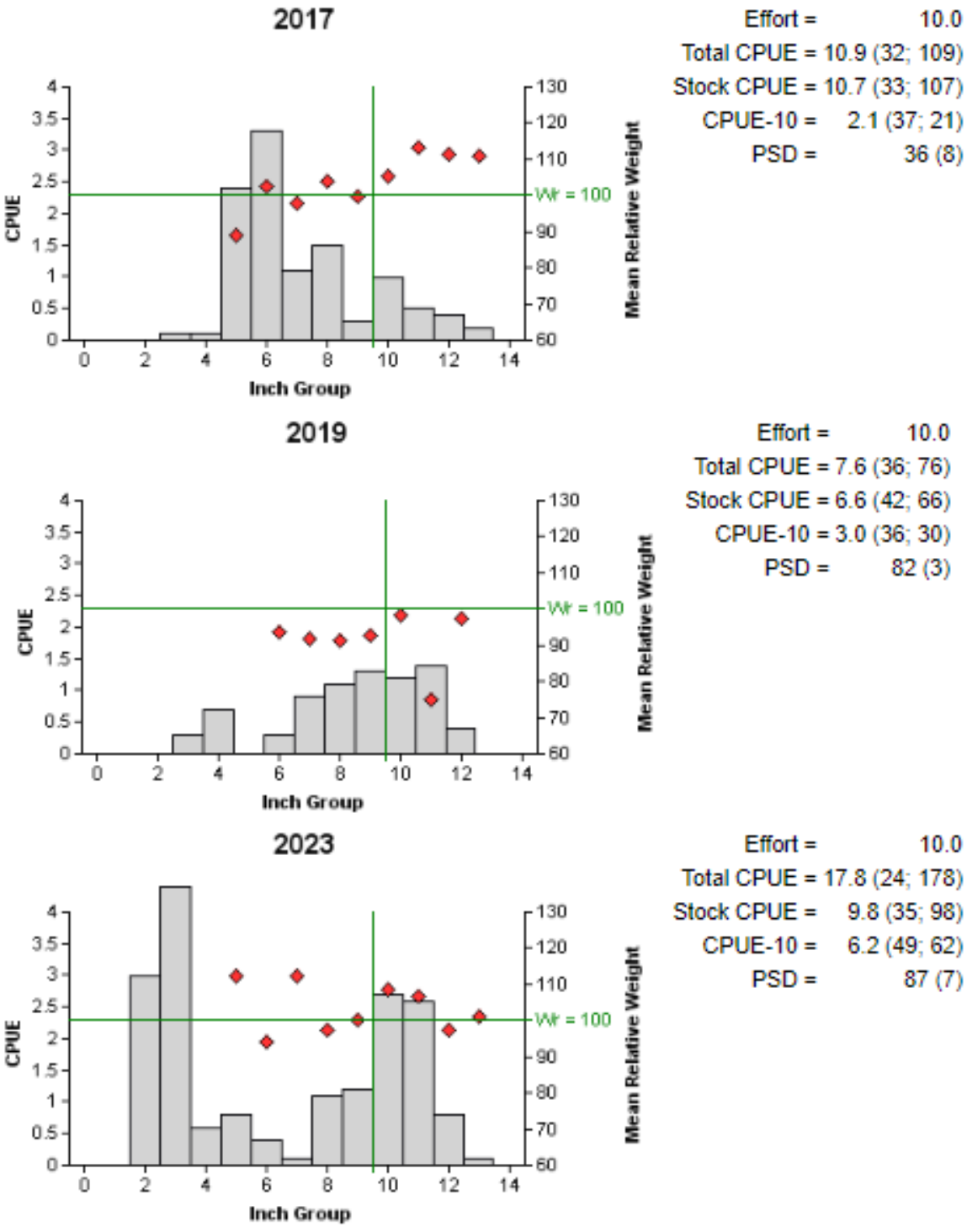


Figure 16. Number of White Crappie caught per net night (CPUE), population indices (RSE and N for CPUE and SE for size structure are in parentheses), and mean relative weights (diamonds) for fall trap netting surveys, Fort Phantom Hill Reservoir, Texas, 2017, 2019, and 2023. Vertical line denotes the 10-in minimum length limit, and the horizontal line represents the relative weight = 100.

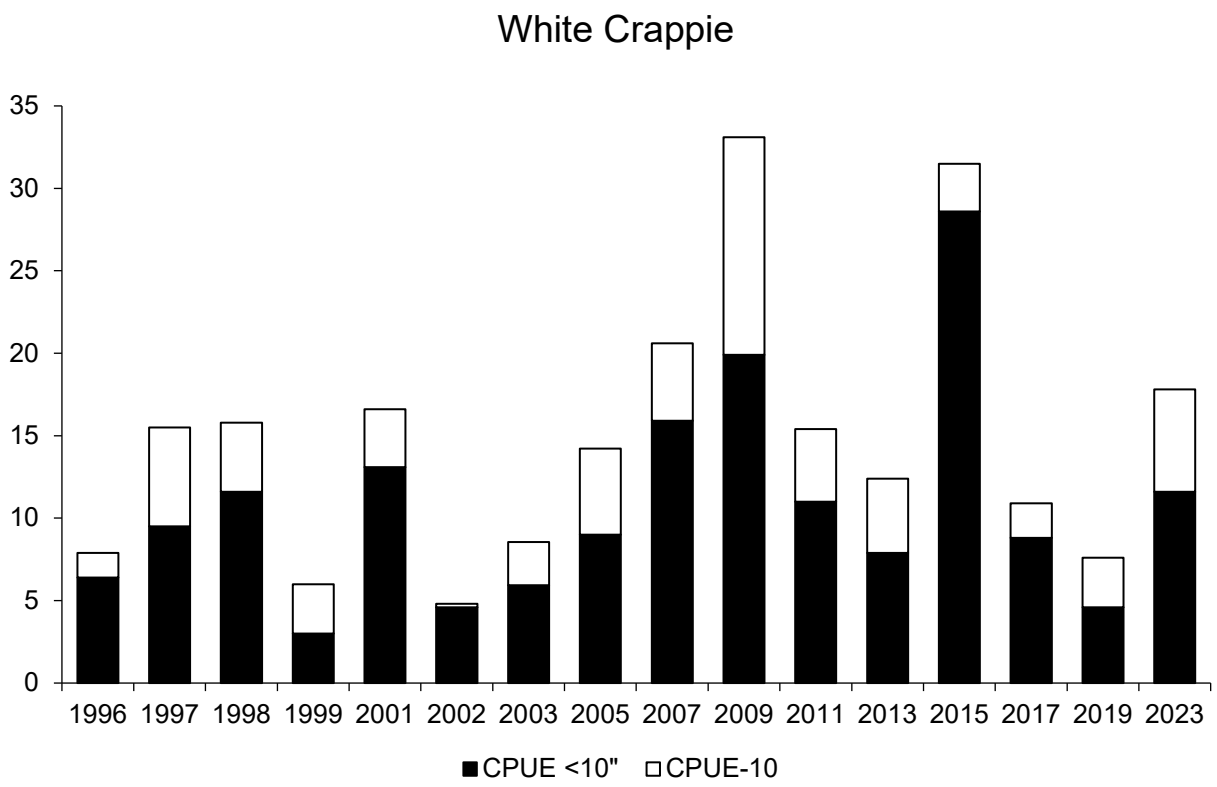


Figure 17. Cumulative catch rates of sub-legal (<10 inches TL; black bars) and legal (≥10 inches TL; white bars) White Crappie caught per net night during fall trap netting surveys, Fort Phantom Hill Reservoir, Texas, 1996-2023.

White Crappie

Table 13. Creel survey statistics for White Crappie at Fort Phantom Hill Reservoir, Texas, from March 2016-November 2017 and December 2021-November 2022. Total catch per hour is for anglers targeting White Crappie and total harvest is the estimated number of White Crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year	
	2016/2017	2021/2022
Surface area (acres)	4,246	4,246
Directed effort (h)	14,609.9 (16)	6,565.3 (22)
Directed effort/acre	3.2	1.5
Total catch per hour	0.7 (48)	2.8 (48)
Total harvest	2,148.1 (38)	13,830.4 (30)
Harvest/acre	0.51 (38)	3.3
Percent legal released	18.1	19.2

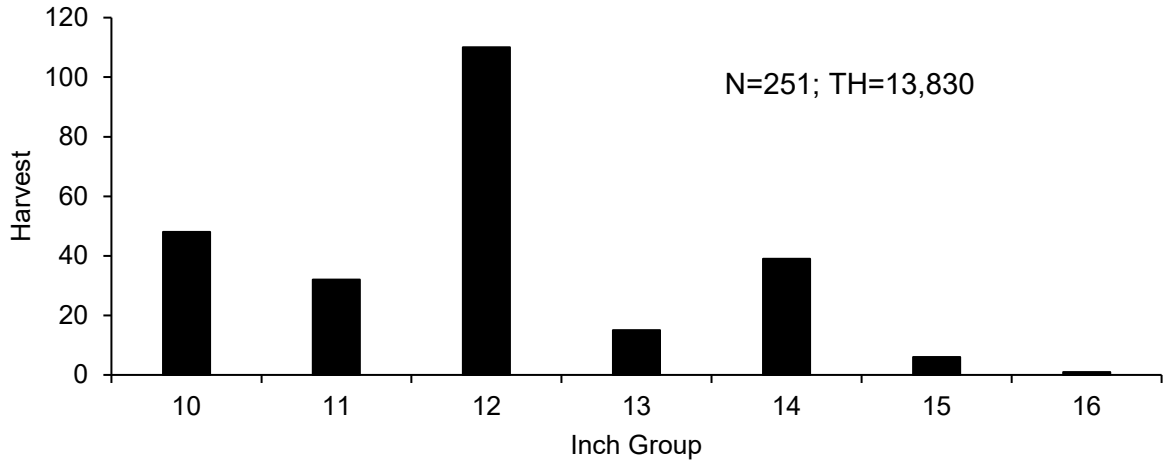


Figure 18. Length frequency of harvested White Crappie by all anglers combined observed during the June 2021-May 2022 creel survey at Fort Phantom Hill Reservoir, Texas. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 14. Proposed sampling schedule for Ft. Phantom Hill Reservoir, Texas. Survey period is June through May. Gill netting and jug lining surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Surveys are denoted by X.

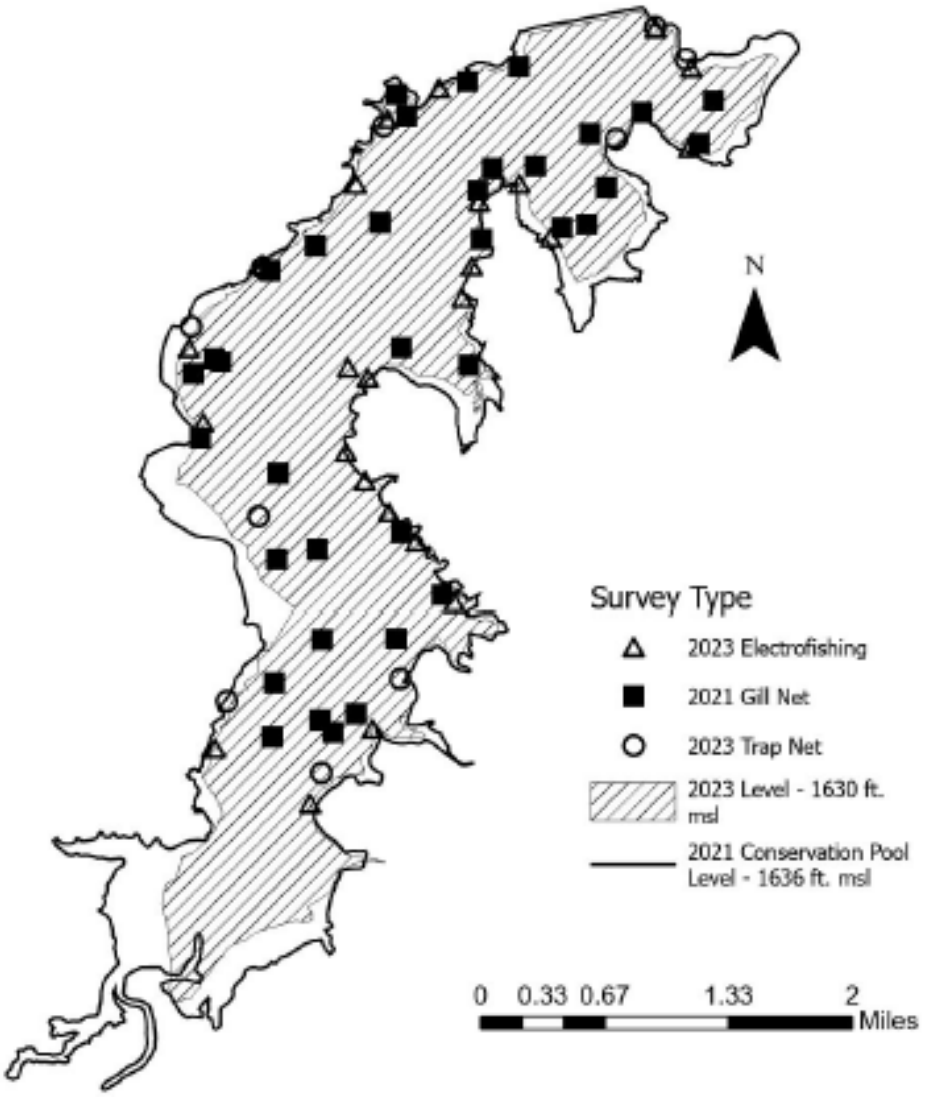
	Survey year			
	2024-2025	2025-2026	2026-2027	2027-2028
Angler Access				X
Structural Habitat				X
Vegetation				X
Electrofishing – Fall		X		X
Trap netting				X
Gill netting				X
Jug lining				X
Report				X

APPENDIX A – Catch for all species and 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, 2022-2023. Sampling effort was two hours for fall electrofishing, 10 net nights for fall trap netting, and 37 net nights for spring gill netting.

Species	Electrofishing		Trap Netting		Gill Netting	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar	2	1.0 (100)				
Gizzard Shad	461	230.5 (21)				
Threadfin Shad	16	8.0 (52)				
Common Carp	3	3 (73)				
Smallmouth Buffalo	17	8.5 (53)				
Blue Catfish	1	0.5 (100)			192	5.2 (15)
Channel Catfish	37	18.5 (37)			268	7.2 (17)
Flathead Catfish	19	9.5 (48)				
White Bass	25	12.5 (52)			482	13,0 (13)
Hybrid Striped Bass	8	4.0 (43)	4	0.4 (100)	317	8.6 (15)
Green Sunfish	6	3.0 (43)				
Warmouth	3	1.5 (73)				
Orangespotted Sunfish			1	0.1 (100)		
Bluegill	297	148.5 (20)	248	24.8 (35)		
Longear Sunfish	121	60.5 (28)	26	2.6 (52)		
Largemouth Bass	82	41.0 (19)	1	0.1 (100)	3	0.1 (56)
White Crappie	1	0.5 (100)	178	17.8 (24)	86	2.3 (23)
Freshwater Drum	15	7.5 (36)				

APPENDIX B – Map of sampling stations

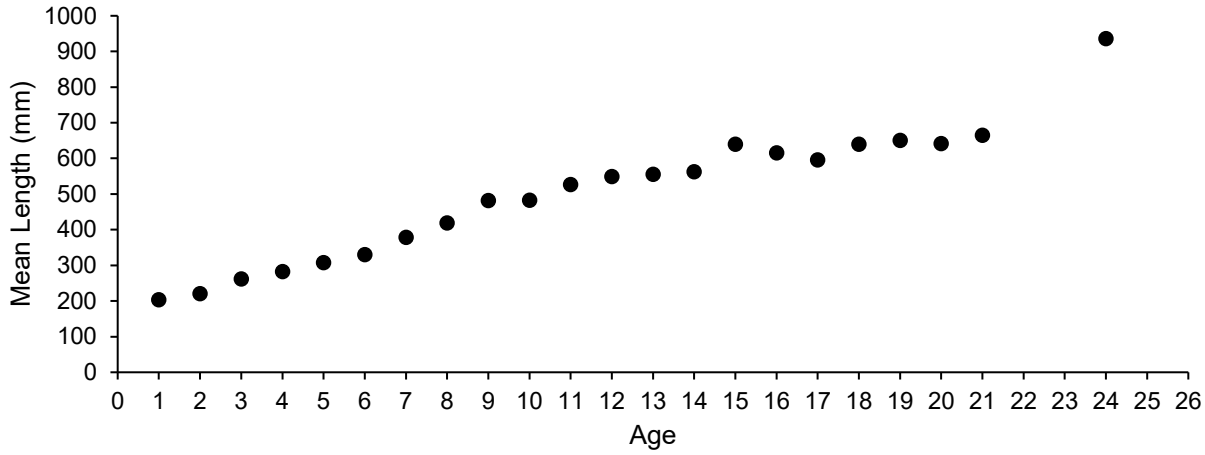


Map of electrofishing, trap netting, and gill netting stations at Fort Phantom Hill Reservoir, Texas, 2021-2023.

APPENDIX C. Mean lengths at age of Blue Catfish

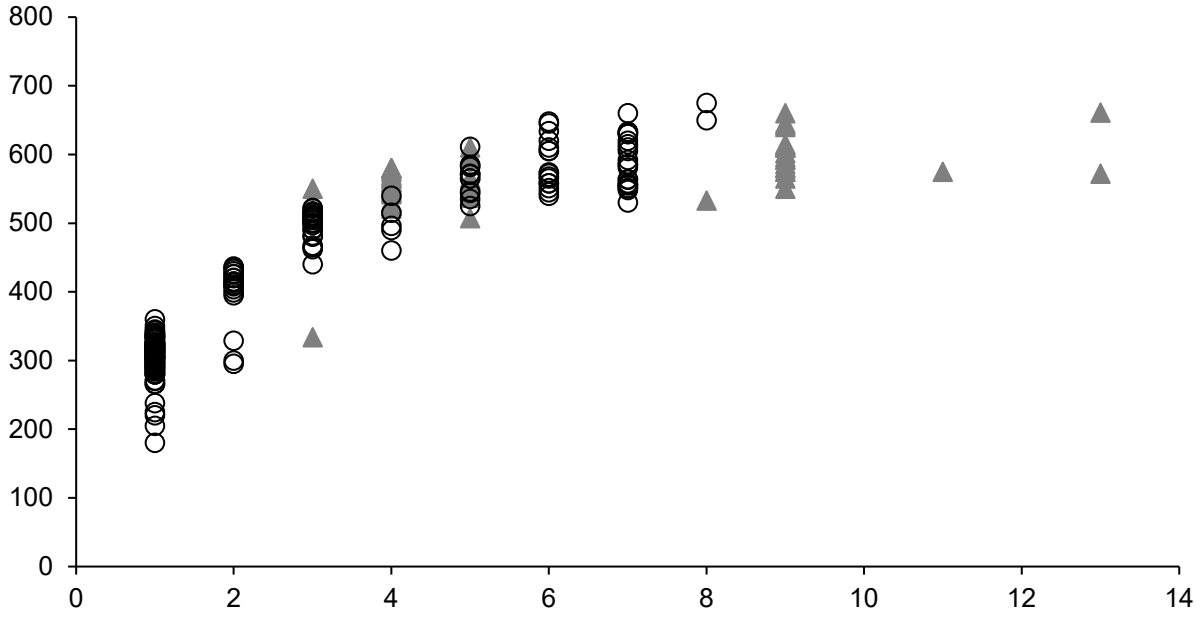
Ages, frequencies, and mean lengths of Blue Catfish collected in spring 2022 gill netting and jug lining surveys, Fort Phantom Hill Reservoir, Texas.

	Jug lining		Gill netting		**Combined surveys**	
Age	N	Mean TL	N	Mean TL	N	Mean TL
1			1	204	1	204
2			3	221	3	221
3			6	262	6	262
4			3	283	3	283
5	1	282	10	311	11	308
6	16	340	55	327	71	330
7	20	393	49	374	69	379
8			6	419	6	419
9	6	459	5	509	11	482
10	3	517	2	431	5	483
11	15	549	22	512	37	527
12	18	544	10	558	28	549
13	17	559	7	549	24	556
14	3	559	2	568	5	563
15	1	640			1	640
16	4	631	4	602	8	616
17	3	606	2	583	5	596
18	1	725	1	555	2	640
19	3	651			3	651
20	3	680	1	525	4	642
21			1	665	1	665
22						
23						
24	1	987	1	885	2	936

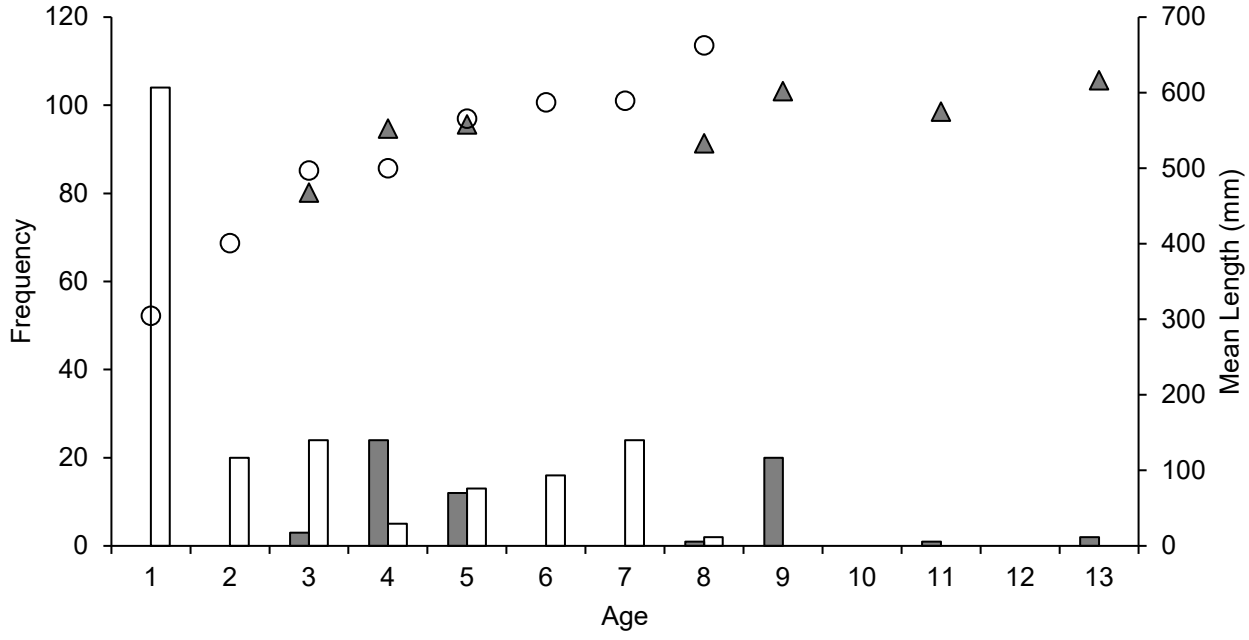


Distribution of mean total length (mm) at age (years) of Blue Catfish collected in spring 2022 gill netting and jug lining surveys combined, Fort Phantom Hill Reservoir, Texas.

APPENDIX D – Age distribution and mean length at ages of Hybrid Striped Bass

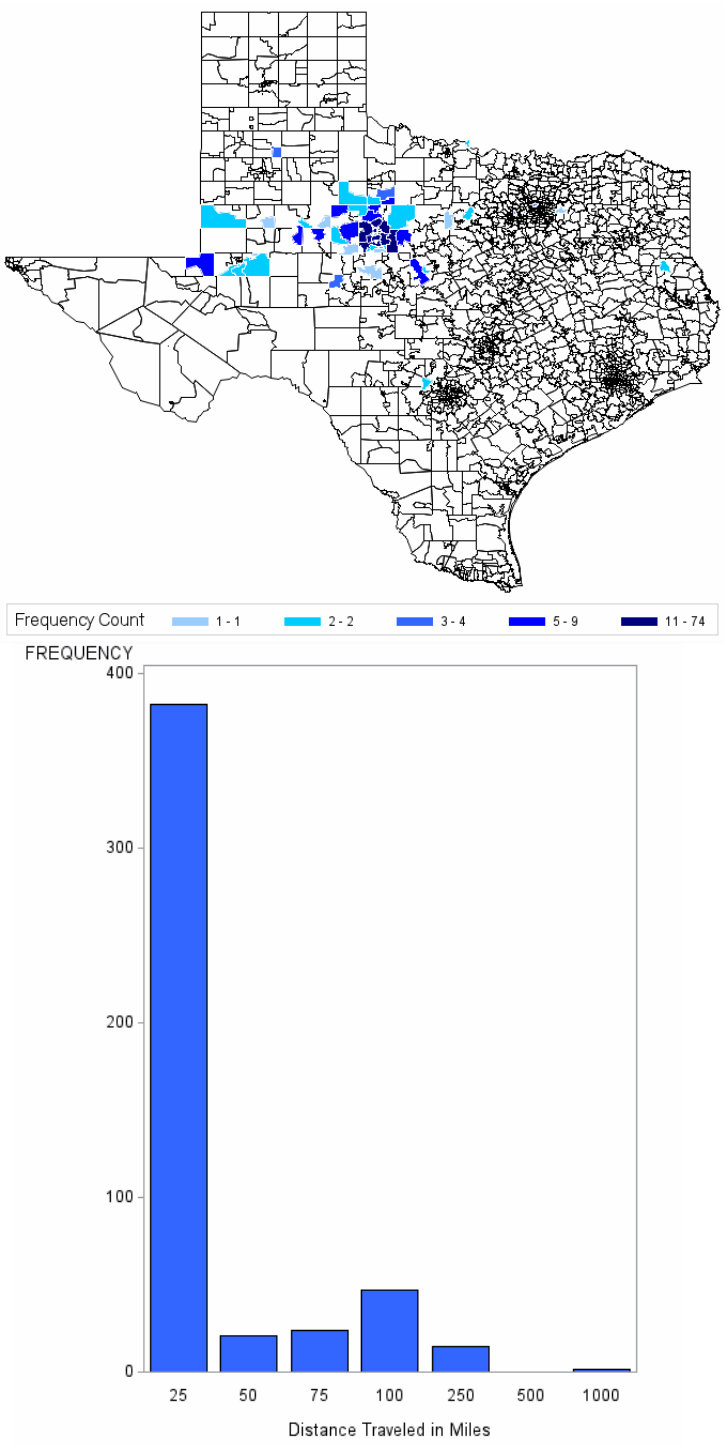


Length-at age distribution for Palmetto Bass (triangles; N=63) and Sunshine Bass (circles; N=208) collected and aged from the spring gill netting survey at Fort Phantom Hill Reservoir, Texas, 2022.



Age frequency and mean length at ages for Palmetto Bass (gray bars and triangles) and Sunshine Bass (white bars and circles) collected during the spring 2022 gill netting survey, Fort Phantom Hill Reservoir, Texas.

APPENDIX E – Map of Zip Codes reported in the 2021-2022 creel survey



Map of anglers by Zip Codes (top) and frequency distributions of miles traveled by anglers reported during the December 2021 – November 2022 creel survey at Fort Phantom Hill Reservoir.

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