

# Possum Kingdom Reservoir

## 2022 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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## Survey and Management Summary

Fish populations in Possum Kingdom Reservoir were surveyed in 2020 and 2022 using electrofishing and 2022 using trap netting and gill netting in 2021 and 2023. Anglers were surveyed from September 2020 through May 2021 with a creel survey. Historical data are presented with the 2020-2023 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:** Possum Kingdom Reservoir is a 15,588-acre impoundment located on the Brazos River approximately 76 miles west of Fort Worth. It has a primarily rocky shoreline with many boat docks. The reservoir was within two feet of conservation pool from January 2019 to January 2022 and then receded to seven feet below conservation pool around January 2023. Possum Kingdom has had a history of golden alga caused fish kills since the early 2000's, though recent events have been rather isolated in scope.

**Management History:** Important sport fish populations include catfish spp., White Bass, Striped Bass, and Largemouth Bass. Possum Kingdom was managed under statewide regulations until September 1, 2002, when the Largemouth Bass minimum length limit was raised to 16 inches and the Striped Bass bag limit was lowered to two per day in response to a golden alga (*Prymnesium parvum*) fish kill that occurred in early 2001. The Striped Bass bag limit was returned to the statewide bag limit on September 1, 2012. The Largemouth Bass length limit returned to the statewide 14-inch minimum on September 1, 2018. The statewide combined Channel and Blue Catfish regulation changed September 1, 2021, from a 25 fish bag limit with a 12-inch minimum length limit to a 25 fish bag limit (in any combination, only 10 fish 20-inch or greater in length), no length limit. Major golden alga mortality events have occurred in 2001, 2003, 2007, and 2010. Smallmouth Bass were stocked in 2020, 2021 and 2022 to rebuild the population. Artificial habitat has been placed around the reservoir since 2013.

### Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch rate of Gizzard Shad was below the historical average, and few Gizzard Shad were available as prey to most predators. Electrofishing catch rate of Bluegill was around the historical average, with Bluegill up to 10-inches sampled.
- **Catfishes:** The Channel Catfish relative abundance was below the historical average. While Blue Catfish were above the historical average. Body condition for both species were considered good with Blue Catfish exhibiting better condition as length increased. Flathead Catfish were present in the reservoir. A nine-month creel survey completed in 2020-2021 determined that catfishes were the third most targeted fish family in the reservoir.
- **Temperate basses:** White Bass relative abundance has remained constant the last four years with good body condition. Striped Bass relative abundance has been much higher than the historical average thanks in part to natural reproduction occurring during some exceedingly high precipitation years. Striped Bass body condition is a concern as it declines with increasing length. Temperate bass were the second most popular group of fish targeted in the reservoir with many guides targeting them.
- **Black bass:** Largemouth Bass relative abundance was slightly above the historical average. Body condition was considered good. Four legacy class Sharelunkers have been caught in the past two years. Largemouth Bass had average growth (age at 14 inches long was 2.2 years). Smallmouth Bass were stocked in 2020-2022 and three were sampled during electrofishing. Nearly 63% of all anglers at Possum Kingdom Reservoir targeted black bass.
- **Crappies:** White and Black Crappie were present in the reservoir in low relative abundance. Few anglers during the creel survey were targeting crappie.

**Management Strategies:** Continue placement of artificial habitat when funding allows and use natural brush to supplement artificial structures when possible. Continue to request stocking Striped Bass. Collect data on trophy-sized Largemouth Bass from the ShareLunker reporting program. Inform the public about the negative impacts of aquatic invasive species. Conduct electrofishing surveys in 2024 and 2026, and gill netting in 2025 and 2027. Access and vegetation surveys will be conducted in 2026.

## Introduction

This document is a summary of fisheries data collected from Possum Kingdom Reservoir from 2020-2023. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2020-2023 data for comparison.

## Reservoir Description

Possum Kingdom Reservoir is a 15,588-acre impoundment constructed in 1941 on the Brazos River. It is in Palo Pinto County approximately 76 miles west of Fort Worth and is operated and controlled by the Brazos River Authority (BRA). Primary uses include flood control, municipal and industrial water supply and recreation. Possum Kingdom was eutrophic with a Carlson's Trophic State Index (TSI) Chl-a of 54.16, which is higher than previous samples. The mean secchi disk reading was 2.22 meters (Texas Commission on Environmental Quality 2020). Primary habitats at time of sampling consisted of rocky shorelines, boat docks, and aquatic vegetation. The reservoir stayed within two feet of conservation pool level between January 2019 and January 2022 and then receded to seven feet below conservation pool level during the 2022-2023 sampling year (Figure 1). Possum Kingdom has had a history of golden alga caused fish kills since the early 2000's, though recent events have been rather isolated and minor in scope. Additional descriptive characteristics for Possum Kingdom are in Table 1.

## Angler Access

Boat access consists of nine public boat ramps at conservation pool (Table 2) and 15 private ramps. When the reservoir was at extreme low elevations, the BRA extended ramps or built alternative deep-water ramps at access points to maintain boat access. Private ramp fees ranged from free to \$35. Bank fishing was available at the public access points including the boat ramps. Two fishing docks (Possum Kingdom State Park and South D&D) are also present on the reservoir.

## Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Lang and Mauk 2018) included:

1. Base Striped Bass stocking requests on reservoir elevation and in flows to reservoir since natural reproduction has been occurring the past few years. Examine age and growth with an additional gill net survey as well as body condition. Monitor prey species abundance as an indicator of predator abundance.
 

**Action:** Performed an additional 2021 gill net survey and age and growth analysis on Striped Bass. Monitored reservoir and in-flow conditions and adjusted stocking requests accordingly. Monitored prey species abundance for indications that predator/prey abundance was a problem.
2. No current creel data exists for the reservoir, and previous creel data was influenced by golden alga caused fish kills occurring during the creel period.
 

**Action:** Performed a 9-month roving creel survey with the reservoir divided into three sections and surveying 12 days a quarter (7 weekend and 5 weekday) in 2020-2021. The summer quarter was not conducted because the reservoir's extremely high recreational boating usage during the day can become somewhat dangerous and shifts angling to night when we do not conduct creel surveys.
3. Many anglers had requested the reintroduction of Smallmouth Bass into the reservoir. Smallmouth Bass thrived in the reservoir until 2001 when a golden alga caused fish kill seemingly eradicated the population. Monitoring of golden alga events and severity was called for to determine if reintroduction was prudent.
 

**Action:** Monitored the reservoir for golden alga blooms and severity. Major events had not occurred for several years (last in 2010), and only small, localized blooms and kills had occurred

recently. It was deemed relatively safe to reintroduce Smallmouth Bass into the reservoir, so they were stocked in 2020, 2021, and 2022.

4. Artificial habitat deployment has been occurring since 2013 when funding has been available through two Friends of Reservoir Chapters, Hell's Gate Bass Club and Mineral Wells Bass Club, and the BRA. Continuing this practice is desired.

**Action:** Artificial habitat was deployed in 2021 thanks to a BRA grant. Christmas trees were deployed around a few of the artificial habitats in 2023 to diversify the habitat available for fish.

5. Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. The financial costs of controlling and/or eradicating 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.

**Action:** Cooperated with the BRA to post and maintain appropriate signage at access points around the reservoir. Continued to contact and educate marina owners about invasive species, and provide them with posters, literature, etc. so that they can in turn educate their customers. Continue educating the public about invasive species using media, internet, and personal contact. Kept informed of future inter-basin water transfers to facilitate potential invasive species responses.

6. Zebra mussels have never been found in the reservoir, although there have been positive tests for their DNA. Additional survey work has yet to identify their presence and follow up DNA analysis has had negative results. This is an especially important issue with Possum Kingdom State Fish Hatchery located below the dam.

**Actions:** Continued checking and maintaining zebra mussel samplers placed throughout the reservoir. Continue working with the Aquatic Invasive Species team to conduct monitoring throughout the reservoir for zebra mussel DNA and veliger presence.

**Harvest regulation history:** Sport fish species in Possum Kingdom Reservoir were historically managed using statewide regulations. However, on September 1, 2002, in response to the golden alga fish kill of 2001, the Largemouth Bass minimum length limit was raised from 14 to 16 inches and the Striped Bass daily bag limit was decreased from five to two fish 18 inches or greater to aid in recovery of the fishery. The Striped Bass bag limit was returned to the statewide bag limit on September 1, 2012. The Largemouth Bass length limit returned to the statewide 14 inch minimum on September 1, 2018. The statewide combined Channel and Blue Catfish regulation changed September 1, 2021, from a 25 fish bag limit with a 12-inch minimum length limit to a 25 fish bag limit (in any combination, only 10 fish 20-inches or greater in length), no length limit. Current regulations are found in Table 3.

**Stocking history:** Possum Kingdom Reservoir has been stocked with Smallmouth Bass, ShareLunker Largemouth Bass, and Striped Bass since the 2018 report. Smallmouth Bass were a reintroduction for the species after the population was nearly eradicated during the golden alga fish kills that occurred in the 2000's. ShareLunker Largemouth Bass are offspring from the legacy class Largemouth Bass caught during 2022 and 2023. Striped Bass stocking did not occur annually since we documented natural reproduction occurring during high flow years for the Brazos River above the reservoir. The complete stocking history is in Table 4.

**Vegetation/habitat management history:** Possum Kingdom Reservoir has no significant vegetation/habitat management history. Noxious vegetation has not been a problem at the reservoir. Native vegetation plantings occurred in 2013 and were doing well until the reservoir elevation dropped to the point that the plants and cages were out of the water. Many areas below Costello Island to the dam have had artificial structures deployed.

Artificial habitat has been deployed with Georgia structures in 2013, and in 2016, 2017, 2018, 2020 and in 2021 with Mossback products (Appendix C). In 2023 Christmas trees were piled around six of the Mossback products.

**Water transfer:** No inter-basin transfers are known to exist. Possum Kingdom Reservoir has been used primarily for water supply by the BRA. There were 19 entities in 2014 that had water supply contracts with BRA that allowed them to remove water from Possum Kingdom Reservoir for different types of uses. Two of these contracts were for industrial purposes, five were for municipal purposes, four were for mining purposes, and eight were for irrigation purposes. Some lakeside property owners also used water from the reservoir for domestic purposes, and there were small water users located along the West Central Brazos Water Distribution System that used raw water pumped from Possum Kingdom Reservoir. Recently, the City of Abilene constructed a pipeline to pump water from Possum Kingdom to a treatment plant in case of drought emergency. In addition to withdrawals for water used directly from the reservoir, water has also been released downstream to pass excess runoff during high flow events, to provide for environmental flows, and for periodic water supply needs.

## Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Possum Kingdom Reservoir (Lang and Mauk 2018). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

**Electrofishing** – Largemouth and Smallmouth Bass, sunfishes, and Gizzard and Threadfin Shad were collected by electrofishing (2 hour 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. An APEX Smith Root electrofishing system was used with a 7000 kW generator. Ages for Largemouth Bass were determined using otoliths from 13 randomly selected fish (range 13.0 to 14.9 inches).

**Trap netting** – Crappie were collected using trap nets (6 net nights at 6 stations). Catch per unit effort for trap netting was recorded as the number of fish caught per net night (fish/nn). Sampling sites were randomly selected from within Cedar Creek arm of the reservoir where the creel survey indicated that most of the crappie angling occurred and because historically crappie populations have been hard to sample in the rest of the reservoir because of steep banks and depth.

**Gill netting** – Blue Catfish, Channel Catfish, White Bass, and Striped Bass were collected by gill netting (15 net nights at 15 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for Striped Bass were determined in 2021 using otoliths from 76 Striped Bass ranging in length from 8.0 to 27 inches.

**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. Electrophoresis analysis was used prior to 2005.

**Statistics** – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight ( $W_r$ )] were calculated for target fishes according to Anderson and Neumann (1996). Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

**Creel survey** – A nine-month roving creel survey was conducted from 2020 through 2021. The creel period was September through May. Angler interviews were conducted on 7 weekend days and 5 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). The reservoir was divided into three sections with each survey date being conducted within a randomly selected section and days were divided into two time periods.

**Habitat** – A structural habitat survey and vegetation survey were conducted in 2022. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

**Water level** – Source for water level data was the United States Geological Survey (USGS 2022-23).

## Results and Discussion

**Habitat:** Littoral zone structural habitat consisted primarily of rocky and natural shoreline (Table 6). Docks and standing timber account for about 4.8% coverage in the littoral zone. Native vegetation is present and makes up less than 1% reservoir coverage (Table 7). Aquatic vegetation found at Possum Kingdom was Bulrush and Coontail. Artificial structures along with some cut trees/brush have been placed into the reservoir since 2013 in partnership with the Friends of Reservoirs chapters Mineral Wells Bass Club and Hell's Gate Bass Club, and the BRA (Appendix C).

**Creel:** While creel surveys were performed at the reservoir in the past, the data from those previous surveys are not presented for comparison for a variety of reasons. Methodology is different such as the current 9-month creel time-period compared to year-long creel periods, nine interview days per quarter compared to the current twelve interview days per quarter, two sections compared to the current three sections, and roving versus access point creel survey. Not only has methodology changed over the years but all previous creel surveys had results which were negatively influenced by golden alga fish kills occurring during the surveys and once by fire which closed the reservoir. While the latest creel survey occurred during the Covid-19 pandemic, it is considered superior to all other surveys in terms of representing angling that occurs at the reservoir. A summer quarter was not completed due to little angling effort during the daytime because of heavy recreational boating activity that makes angling difficult and somewhat unsafe. The angling that does occur during summer is typically at night associated with lights which a typical creel survey would miss. Directed fishing effort by anglers was highest for black bass (63.3%), followed by anglers fishing for anything (16.2%) and temperate bass (10.5%; Table 8). Total fishing effort for all species was 11.7 h/acre and direct expenditures at Possum Kingdom Reservoir were quite high (\$2.4 million) compared to previous creels (<\$1.0 million, Table 9). Anglers spent an average of \$13.00/h of angling. Possum Kingdom Reservoir is a popular angling destination as evidenced by the number of anglers that traveled 250 to 500 miles to fish the reservoir (Appendix D).

**Prey species:** Electrofishing catch rates of Bluegill and Gizzard Shad were 178.0/h and 109.5/h, respectively. Index of Vulnerability for Gizzard Shad was poor, indicating that only 39% of Gizzard Shad were available to existing predators; this was lower than IOV estimates in previous years (Figure 2). Total CPUE of Gizzard Shad was considerably lower than previous surveys (Figure 2) and well below the historical average of 260.1/h (Appendix E). This is a little concerning since in the fall there was a Striped Bass die off where the fish seemed very emaciated. Total CPUE of Bluegill in 2022 was lower than the 2018 and 2020 surveys (Figure 3), though it is above the historical average. Size structure ranged from 2 to 10 inches in length (Figure 3). The creel survey found sunfish were not targeted by anglers at the reservoir, even though there are some big fish present.

**Blue Catfish:** The gill net catch rate of Blue Catfish was 4.3/nn in 2023, down from the previous survey completed in 2021 which had the highest abundance rate (7.8/nn) for the reservoir (Figure 4). The 2023 rate was the third highest for the reservoir (Appendix E). Sampled Blue Catfish measured 9 to 31 inches in length, similar to past surveys. Body condition as measured by  $W_r$  ranged from 79 to 130, generally increasing with length (Figure 4). This indicates that prey is not a problem for this species. Directed fishing effort, catch per hour, and total harvest for Blue Catfish showed a minimal catfish fishery (Table 10). Blue Catfish were a harvest-oriented fish as only 5% of the legal-sized fish were released (Table 10). Observed harvest from the 2020-21 creel ranged in length from 14 to 20 inches (Figure 5). Some catfish tournaments are held annually at the reservoir which usually have some impressive winning weights but unfortunately the creel dates did not line-up with tournament dates.

**Channel Catfish:** The gill net catch rate of Channel Catfish was 1.9/nn in 2023, which continues a decrease in relative abundance since the 2019 gill net survey (Figure 6). Body condition ranged from 86 to 110 with no apparent trends between body condition and length (Figure 6). Directed fishing effort, catch per hour, and total harvest for Channel Catfish showed a minimal catfish fishery (Table 11). Few anglers were targeting Channel Catfish and only two Channel Catfish were observed harvested during the creel survey. (Figure 7). Like many of our district reservoirs, anglers showed a distinct preference for Blue Catfish.

**White Bass:** The gill net catch rate of White Bass was 3.6/nn in 2023, identical to the previous survey conducted in 2021 (Figure 8). Body condition was considered good ranging from 87 to 97 (Figure 8). Directed fishing effort, catch per hour, and total harvest for White Bass was 3,558/h, 2.0 fish/h, and 7,121 fish, respectively, from

September 2020 through May 2021 (Table 12). While only 2.0% of the anglers targeted White Bass, 5.3% were targeting Temperate Bass making them a very important component of the fishery which supports many guides (Table 8). White Bass were more of a catch and release oriented fish as approximately 71.8% of the legal-length White Bass were released (Table 12). Observed harvest from the creel survey showed good angler compliance, and harvested fish ranged in length from 11 to 16 inches (Figure 9).

**Striped Bass:** The gill net catch rate of Striped Bass was 6.1/nn in 2023, down from 11.7/nn in 2021 (which was the highest relative abundance at the reservoir) but still one of the highest relative abundances we have documented (Figure 10, Appendix E). Size structure ranged from 8 to 30 inches in length, similar to the 2021 survey. There were quite a few bigger Striped Bass in the current survey as evidenced by a PSD of 62 compared to the 2021 PSD of 9 (Figure 10). Body condition declined severely as fish grew, 13-inch Striped Bass had a  $W_r$  of 105 while 25-inch Striped Bass had a  $W_r$  of 77 (Figure 10). This decline is concerning, especially considering the Striped Bass kill that occurred near the end of the 2022 summer when many larger, skinny Striped Bass were struggling at the surface. Guides first reported the phenomenon, but we were unable to determine the cause, it was suspected it might have to do with the water temperature being too high during the summer. It was noted that the Gizzard Shad population abundance was down in the 2022 electrofishing survey, it was primarily the smaller shad that were missing, and it would be anticipated that the bigger Striped Bass would eat larger Gizzard Shad. Examining other predator species sampled (Blue Catfish, White Bass, Largemouth Bass, and White Crappie), there doesn't appear to be a problem with declining body condition in their populations. In 2021 Striped Bass collected from the gill net survey attained legal-length (18-inches) between age 2 and 3 (Figure 12). Age-2 fish ranged from 9 to 21-inches (Figure 12). This cohort appears to be a result of natural reproduction as no Striped Bass were stocked that year. During the creel, 3.2% of anglers identified as targeting Striped Bass and 5.3% were targeting Temperate Bass<sup>63</sup> (Table 8). There are several guides supported by the *Morone* fishery at the reservoir. Directed effort, angler catch, and angler harvest of Striped Bass was 5,838/h, 1.2/h, and 2,562 (Table 13). Harvested fish ranged in length from 16 to 29 inches in length (Figure 11). Under-sized fish made up 9.0% of the observed harvest while anglers also released 47.5% of legal length bass (Table 13).

**Smallmouth Bass:** Prior to golden alga kills beginning in 2001, Smallmouth Bass were quite abundant. No major golden alga kills have occurred since 2010. Since 2010 no major golden alga kills have occurred and no Smallmouth Bass have been sampled, although we would occasionally hear of one being caught. Smallmouth Bass were re-introduced in 2020 and since that time 255,860 fingerlings and 509 adults have been stocked into the reservoir (Table 4). Since the stockings, many reports have been received of Smallmouth Bass being caught by anglers. Three Smallmouth Bass were collected during the electrofishing survey, a 4-inch, 7-inch, and a 12-inch with  $W_r$ 's of 72 and 79 for the stock-length bass. The sample size is small so monitoring of this species in the future will answer whether the reintroduction was a success.

**Largemouth Bass:** The electrofishing catch rate of Largemouth Bass was 66.5/h in 2022, higher than the historical average of 59.6/h, but slightly down from 2020 when the catch rate was 70.0/h (Figure 13, Appendix E). Size structure is considered good as PSD has varied from 52 to 72 since 2018 (Figure 13). Relative weights remained constant throughout the inch-classes ranging from 86 to 95 for the 8 to 19-inch length bass. Relative weights have exhibited a similar range in the previous two electrofishing surveys (82 to 92 in 2018 and 81 to 111 in 2020; Figure 13) and are considered normal for this reservoir. Growth of legal-length Largemouth Bass in 2020 was good; average age at 14 inches (13.0 to 14.9 inches) was 2.2 years (N = 13; range = 1 – 4 years). In 2022, Possum Kingdom produced three Legacy class ( $\geq 13.0$  lb. Largemouth Bass) ShareLunkers, the first 13+ lb. Largemouth Bass from the reservoir since 1991. All three were pure Florida strain bass. Since the ShareLunker program inception in 2018, four Legacy class fish, ten Elite class fish (10.0 lb. to 12.99 lb.) and thirty-one Lunker class fish (8.0 lb. to 9.9 lb.) have been turned into the program from Possum Kingdom (Appendix F). Directed fishing effort, catch per hour, and total harvest for black bass was 115,411 h, 0.4 fish/h, and 1,964 bass, respectively, from September 2020 through May 2021 (Table 14). Largemouth Bass are the most sought-after fish by anglers with 35% of the anglers identifying themselves as non-tournament bass anglers at the time of the creel interview (Table 8). Possum Kingdom hosts many bass tournaments, and they were well represented in the creel survey with an estimated 27.9% of all anglers participating in a bass tournament during the creel survey. Black bass anglers composed of 63.3% of all anglers fishing during the creel survey period. There is harvest of Largemouth Bass occurring among non-tournament anglers with only 70.6% of legal-length Largemouth Bass being released (Table 14). Illegal harvest was also noted during the creel survey though it was only two observed fish (Figure 14).

**Crappies:** Sampling of crappie was not in the objective-based sampling plan but was completed to examine if we could gather more meaningful crappie data by altering the sampling protocol. The 2022 trap net catch rate of White and Black Crappie was 2.7/nn and 1.2/nn respectively (Figures 15 and 16). It should be noted that the 2010 and 2014 data was collected throughout the reservoir. It does not appear that sampling in the Cedar Creek arm improved the data, especially when the RSE increased from that collected in 2010. With only 2.6% of anglers targeting crappie (Table 8), attempting to collect data on these species is not warranted. During the creel survey, an estimated 4,778 h was spent targeting crappie with a catch rate of 0.7/h. Total harvest was only 3,355 with nearly identical harvest of White and Black Crappie making up the total (Table 15). Harvested crappie ranged from 10 to 14-inches in total length (Figure 17). Most legal-length crappie caught were harvested, with only 17.0% being released (Table 15).

# Fisheries Management Plan for Possum Kingdom Reservoir, Texas

Prepared – July 2023

**ISSUE 1:** The recent gill net survey found Striped Bass had declining  $W_r$ 's with increasing length. Striped Bass have historically been requested and stocked annually to maintain the fishery. However, during periods of above normal precipitation, conditions have allowed natural recruitment to occur.

## MANAGEMENT STRATEGIES

1. A stocking request of 5/acre will occur annually, but the actual stocking will be dependent upon conditions at the time of stocking.
2. Monitor the population with an additional gill net survey during 2025 and standard sampling in 2027.

**ISSUE 2:** Smallmouth Bass were reintroduced in 2020 after golden alga caused fish kills decimated the population in the early 2000's. The reservoir received stockings three years in a row with the last occurring in 2022. No further stocking requests are planned at this time until the past stockings are evaluated.

## MANAGEMENT STRATEGIES

1. Collect population information during scheduled electrofishing surveys. Determine if natural recruitment is occurring by aging any small Smallmouth Bass that are sampled.
2. Monitor and contact bass clubs to see if Smallmouth Bass are being caught and get an idea whether they are growing and entering the fishery.

**ISSUE 3:** Possum Kingdom has the potential of producing trophy sized Largemouth Bass as evidenced by the three Legacy class ShareLunker bass donated in 2022 and one Legacy class fish donated in 2023. Genetics play an important role in determining trophy potential.

## MANAGEMENT STRATEGIES

1. Request a stocking of Lone Star Bass which are 2<sup>nd</sup> generation offspring of pure Florida strain ShareLunker Largemouth Bass that have proven to be able to grow to  $\geq 13$  pounds at a rate of 1,000/km of shoreline in 2024 and 2025.
2. Examine the Largemouth Bass genetics in 2026.

**ISSUE 4:** Possum Kingdom is known as a Largemouth Bass and temperate bass fishery. The Bluegill fishery offers abundant and memorable length fish for anglers to target. Anglers did not target Bluegill during the creel. Quality Bluegill fisheries are lacking in the area.

## MANAGEMENT STRATEGY

1. Promote the quality Bluegill fishery via social media and in conversations with anglers.

**ISSUE 5:** Habitat enhancement by deploying artificial structures has been going on since 2013 to address habitat loss in the aging reservoir. These efforts were supported by two Friends of Reservoir Chapters, Hell's Gate Bass Club and Mineral Wells Bass Club, and the BRA.

## MANAGEMENT STRATEGIES

1. Funding for additional Mossback artificial habitat has been secured from the BRA in 2023. Purchased habitat will be placed in a new location by Costello Island.

2. The District placed about 60 Christmas trees in 2023 next to existing Mossback structures already in the reservoir.
3. Make habitat improvement locations public by placing their GPS coordinates onto the Possum Kingdom TPWD web page.
4. Continue applying for grants to improve habitat within the reservoir.

**ISSUE 6:** While zebra mussels have never been found in the reservoir, there have been positive tests for their eDNA. Additional survey work has yet to identify their presence and follow up DNA analysis has had negative results. This is especially important with Possum Kingdom State Fish Hatchery located below the dam. If zebra mussels are found in the reservoir, hatchery protocols and usage would need to be altered.

#### MANAGEMENT STRATEGIES

1. Continue checking and maintenance of zebra mussel samplers placed throughout the reservoir.
2. Continue working with the Aquatic Invasive Species team and the hatchery to conduct monitoring throughout the reservoir and hatchery incoming water for zebra mussel detection.

**ISSUE 7:** Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

#### MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about invasive species using 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 (2023–2027)

### Sport fish, forage fish, and other important fishes

Sport fishes in Possum Kingdom Reservoir include Channel and Blue Catfish, Black and White Crappie, Striped and White Bass, and Smallmouth and Largemouth Bass. Known important forage species include Bluegill, and Threadfin and Gizzard Shad.

### Negligible fisheries

**Black and White Crappie** are present in Possum Kingdom Reservoir, but relative abundance is moderate to low. Trap net surveys have historically resulted in low CPUE of crappie ranging from 0.1 to 9.5 fish/nn with the average of 3.3/nn (Appendix E). The reservoir is steep-sided and deep possibly negatively influencing trap netting results. In 2022, nets were set in Cedar Creek where the reservoir is not as steep and deep and where crappie angling pressure occurred during the creel survey. The resulting catch rate did not improve. The creel surveys indicated low directed effort (2.6%, Table 8). Presence/absence will be evaluated with gill nets or through other sampling methods. Sampling this population is unnecessary in the 2023 to 2027 sampling period.

**Flathead Catfish** are present but sampled in very low numbers and no directed effort was found during the creel, so they will not be a target of the survey work during the 2023 to 2027 sampling period.

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

**Largemouth Bass** are the most popular sport fish in Possum Kingdom Reservoir as evidenced by the results from the most recent creel survey. The popularity and reputation for Largemouth Bass fishing at this reservoir warrant sampling time and effort. Trend data on CPUE, size structure, and body condition have been collected biennially since 1996 in this clear reservoir with fall nighttime electrofishing and will continue during the next four years. A category II age and growth analysis was completed in 2020. A type III age-and-growth survey will be completed in 2024 to obtain better growth information for the entire size-structure of the population. Genetic analysis was completed in 2018 and will be completed in 2026 given that ShareLunker offspring have been stocked and Lone Star Largemouth Bass are now being introduced. Twenty-four randomly selected 5-min electrofishing sites will be sampled in 2024 and 2026, which historically has provided CPUE-S RSE's of <25 and are expected to provide more than 50 stock-length bass for evaluating size structure and body condition. Relative weight of Largemouth Bass  $\geq 8$ " TL will be determined from their length/weight data (maximum of 10 fish weighed and measured per inch class). No additional random sites will be completed if the target is not met. However, to collect enough Largemouth Bass for age-and-growth, extra electrofishing will occur if necessary to meet the required number of Largemouth Bass.

**Smallmouth Bass** at present are not abundant enough to set any target metrics. An exploratory sample to determine presence/absence will occur during the twenty-four randomly selected 5-min electrofishing sites in 2024 and 2026 as part of the Largemouth Bass survey. Any fish captured under seven inches in length will be retained for aging to determine if natural reproduction is taking place.

**Bluegill** are a primary forage species at Possum Kingdom Reservoir. Like Largemouth Bass, trend data on CPUE and size structure of Bluegill have been collected every two years. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in Bluegill relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass should result in a sample of 50 or more stock-length Bluegill for size structure estimation. No additional effort will be expended to achieve an RSE 25 for CPUE-Total of Bluegill. Instead, Largemouth Bass body condition can provide information on forage relative abundance, vulnerability, or both relative to predator density.

**Gizzard and Threadfin Shad** are present in Possum Kingdom Reservoir, but population relative abundance has been moderate ranging from 109.5-295.5/h for Gizzard Shad during the previous three surveys. Gizzard Shad will be sampled in 2024 and 2026 as per Largemouth Bass above for general monitoring with objectives of CPUE-total RSE  $\leq 25$  and a sample of 50 or more stock-length Gizzard Shad for size structure and prey availability. Threadfin Shad will also be sampled during the electrofishing survey for general trend data of CPUE total to compare to previous surveys. No extra sampling will be conducted to achieve these goals.

**Temperate bass** (Striped and White Bass) are the second most popular species in the reservoir according to a 2020-2021 creel survey. Numerous guides and their clients target Striped and White Bass. The populations historically have been surveyed every other year and this will continue with gill net surveys planned in 2025 and 2027. In the past, the population has been adversely affected by occasional golden alga caused fish kills which has affected both the populations and angling for these species. But the population has rebounded since 2010 and once again has become a premier fishery. General monitoring for this species using 15 gill nets historically has provided a CPUE-S RSE of <25. Given previous Striped Bass catch rates, this level of sampling should result in the 50-stock length fish needed for size structure analysis and body condition. No extra sampling will occur if objective sampling size is not met. White Bass data will be collected while sampling Striped Bass, but no targeted goals or objectives will be established.

**Blue and Channel Catfish** are present in Possum Kingdom Reservoir, and population relative abundance is considered moderate. Historical relative abundance for Blue and Channel Catfish is 1.9/nn and 2.6/nn, respectively. The 2020-2021 creel survey indicated catfish spp. are the third most sought-after species. The creel survey also documented low harvest for both species. Sampling the catfish populations beyond what is collected while sampling Striped Bass data is deemed unnecessary. The current sampling regime for Striped Bass most likely will result in a CPUE-S RSE of <25 for Blue Catfish and result in 50-stock-length fish needed for size structure analysis.

Sampling schedule is in Table 16.

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## Tables and Figures

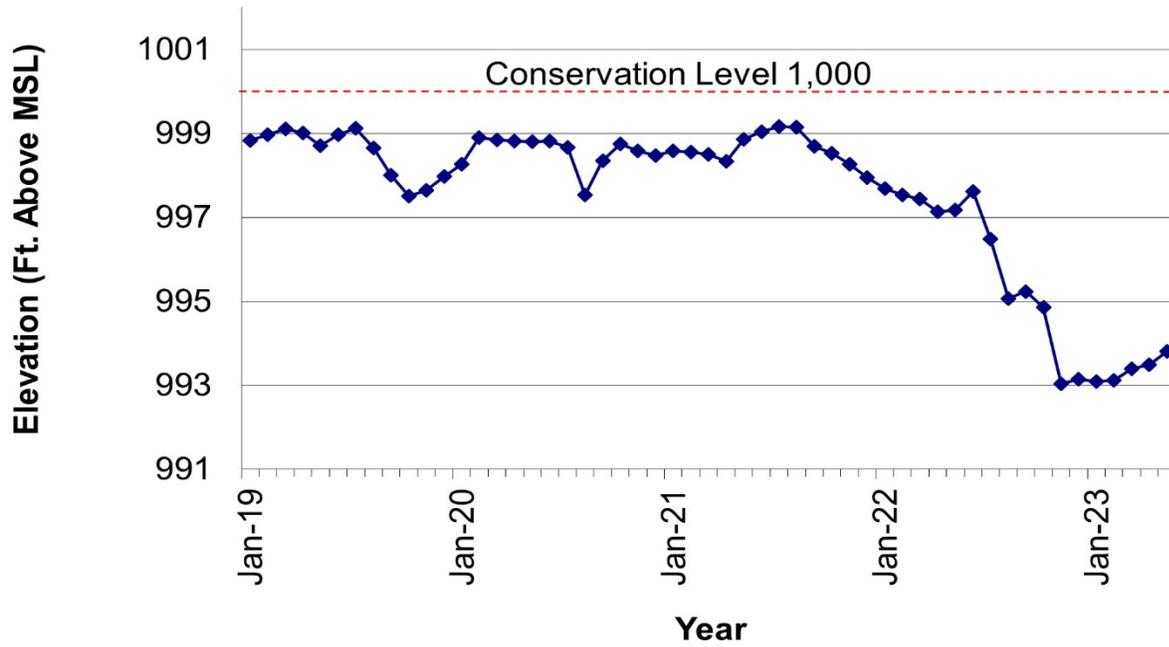


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Possum Kingdom Reservoir, Texas.

Table 1. Characteristics of Possum Kingdom Reservoir, Texas.

Characteristic	Description
Year constructed	1941
Controlling authority	Brazos River Authority
County	Palo Pinto
Reservoir type	Mainstem
Shoreline Development Index	14.4
Conductivity	2,383 $\mu\text{S/cm}$

Table 2. Boat ramp characteristics for Possum Kingdom Reservoir, Texas, August 2022. Reservoir elevation at time of survey was 994.9 feet above mean sea level. Most ramps have over-flow parking available beyond the parking capacity listed. Only public ramps are listed below, there are private ramps that charge a fee to launch.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Public Ramp	32.8913 -98.4703	Y	54	990	Good
Public Ramp Low Water	32.8921 -98.4689	Y	11	981	Good, but only usable at low water
North D & D	32.8846 -98.4892	Y	17	979	Good
Sandy Beach	32.8886 -98.5235	Y	10	988	Good
Bugs Beach	32.8754 -98.5041	Y	15	990	Good
South D & D	32.8831 -98.4863	Y	60	990	Good
Scenic Cove	32.8846 -98.4507	Y	27	992	Good
Scenic Cove Low Water	32.8884 -98.4484	Y	20	982	Good
State Park	32.8804 -98.8754	Y	20	983	Good
Elm Creek	32.9089 -98.4961	Y	15	991	Good

Table 3. Harvest regulations for Possum Kingdom Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids, and subspecies	25 (only 10 $\geq$ 20 inches)	None
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Striped	5	18-inch minimum
Bass, Largemouth and Smallmouth	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 Possum Kingdom Reservoir, Texas. Size categories are FRY =<1 inch, FGL = 1-3 inches, AFGL = 8 inches, ADL = mature fish, and UNK = unknown.

Species	Year(s) Stocked	Number of Years	Number Stocked	Size
Blue Catfish	2002	1	70,955	FGL
Channel Catfish	1972-2001	2	11,492	AFGL
	2001-2013	3	605,609	FGL
Florida Largemouth Bass	1973-1978	3	475,070	FRY
	1976-2015	10	3,497,215	FGL
	2002	1	77	ADL
	2018	1	84,421	FGL
Northern Largemouth Bass	1966-1972	2	348,983	UNK
	1970-1972	2	786,640	FRY
	2005	1	223,690	FGL
ShareLunker Largemouth Bass <sup>a</sup>	2022	1	21,049	FGL
Smallmouth Bass	1978	1	162,000	UNK
	1984-2001	5	303	ADL
	1998-2003	3	361,225	FGL
	2002	1	500	AFGL
	2020	1	43,440	FGL
	2021	1	105,300	FGL
	2021	1	298	ADL
	2022	1	107,120	FGL
	2022	1	211	ADL
Striped Bass	1976-1983	4	488,214	UNK
	1986-2017	13	19,701,025	FRY
	1986-2018	27	4,639,159	FGL
	2019	1	19	ADL
	2021	1	21	ADL
	2021	1	47,847	FGL
	2022	1	41	ADL
	2022	1	99,348	FGL
	2022	1	424,714	FRY
Threadfin Shad	1980	1	8,600	UNK
Walleye	1964-1975	5	16,100,000	FRY

<sup>a</sup> ShareLunker Largemouth Bass are 1<sup>st</sup> generation offspring from angler-donated Largemouth Bass ≥ 13 pounds from the Toyota ShareLunker program.

Table 5. Objective-based sampling plan components for Possum Kingdom Reservoir, Texas 2019–2023.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE–Stock $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 14 inches	$N = 13, 13.0 - 14.9$ inches
	Condition	$W_r$	10 fish/inch group (max)
Bluegill <sup>a</sup>	Abundance	CPUE–Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad <sup>a</sup>	Abundance	CPUE–Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$
	Prey availability	IOV	$N \geq 50$
<i>Gill netting</i>			
Striped Bass	Abundance	CPUE–Stock	RSE–Stock $\leq 25$
	Size structure	PSD, length frequency	$N = 50$

<sup>a</sup> No additional effort will be expended to achieve an RSE  $\leq 25$  for CPUE of Bluegill and Gizzard Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Survey of structural habitat types, Possum Kingdom Reservoir, Texas, 2022. Shoreline habitat type units are in miles and boat docks, flooded terrestrial vegetation, and standing timber are in acres.

Habitat type	Estimate	% of total
Bluff	13.4 miles	9.0
Bulkhead	1.7 miles	1.1
Natural	60.2 miles	40.5
Rocky	73.4 miles	49.4
Boat docks	434.0 acres	2.7
Flooded terrestrial vegetation	124.0 acres	0.8
Standing timber	327.0 acres	2.1

Table 7. Survey of aquatic vegetation, Possum Kingdom Reservoir, Texas, 2006, 2010, 2014, 2018, and 2022. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2006	2010	2014	2018	2022
Native submersed	205.0 (1.3)	0.7 (<0.1)	0.0	30.9 (0.2)	1.0 (<0.1)
Native emergent	461.0 (3.9)	10.9 (0.1)	0.0	75.0 (0.5)	1.5 (<0.1)

Table 8. Percent directed angler effort by species for Possum Kingdom Reservoir, Texas, 2020–2021. Survey periods were from 1 September through 31 May.

Species	2020/2021
Blue Catfish	2.0
Channel Catfish	0.2
Catfish <i>spp.</i>	5.3
White Bass	2.0
Striped Bass	3.2
Temperate bass <i>spp.</i>	5.3
Largemouth Bass	35.0
Black bass <i>spp.</i>	0.4
Bass tournament	27.9
White Crappie	1.2
Crappie <i>spp.</i>	1.4
Anything	16.2

Table 9. Total fishing effort (h) for all species and total directed expenditures at Possum Kingdom Reservoir, Texas, 2020-2021. Survey periods were from 1 September through 31 May. Relative standard error is in parentheses.

Creel statistic	2020/2021
Total fishing effort	182,479 (16)
Total directed expenditures	\$2,369,143 (55)

## Gizzard Shad

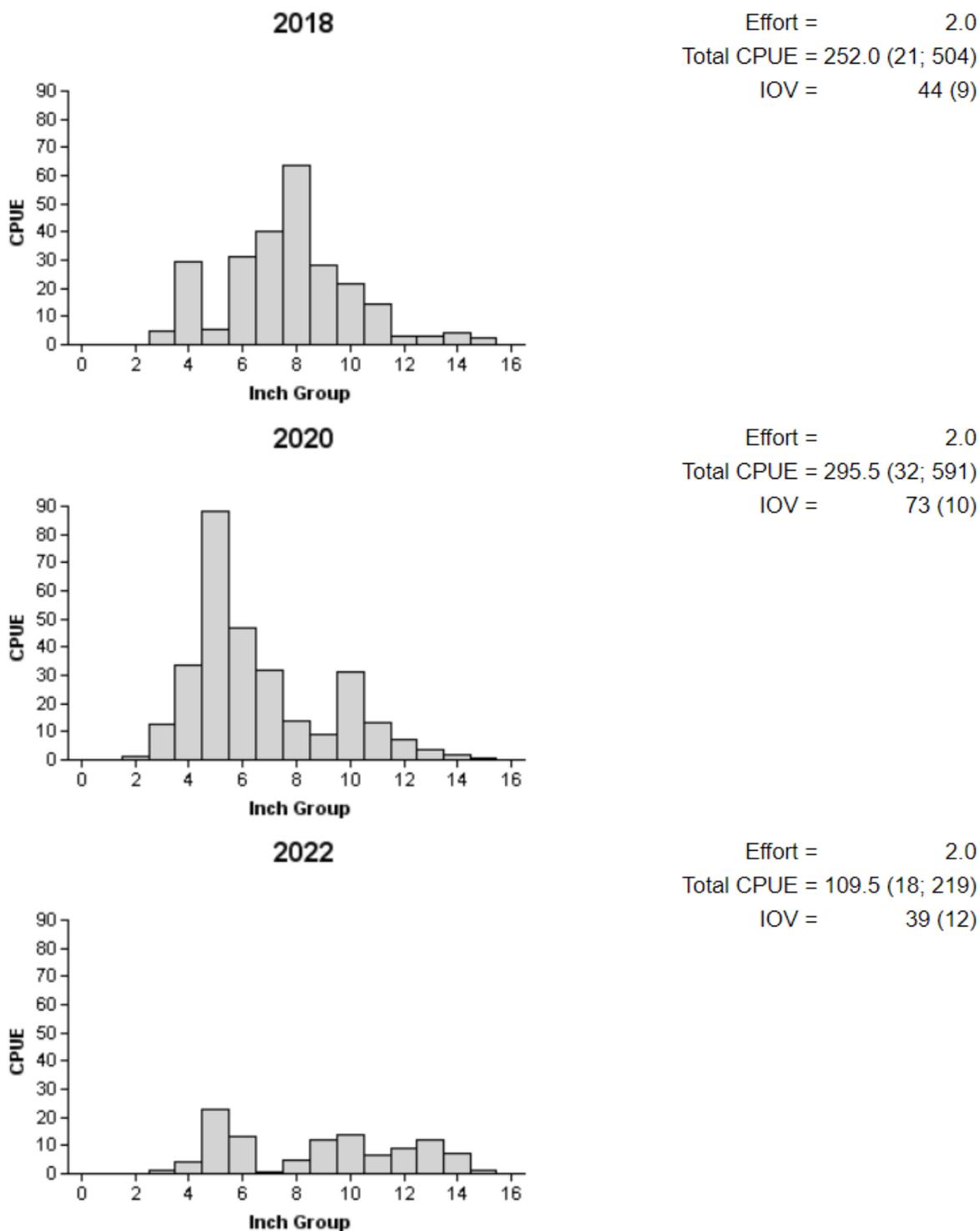
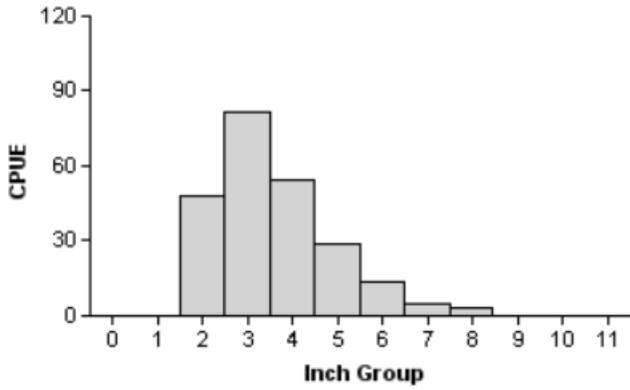


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Possum Kingdom Reservoir, Texas, 2018, 2020, and 2022.

## Bluegill

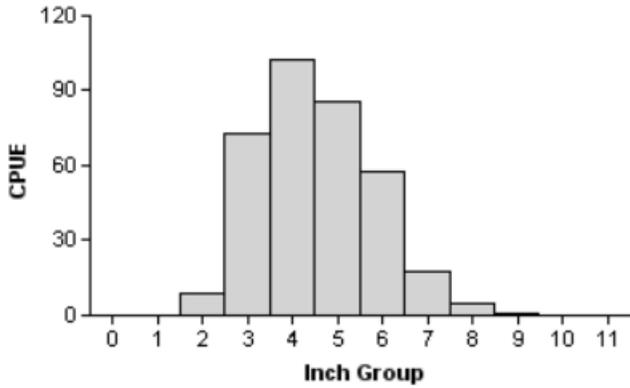
**2018**

Effort = 2.0  
 Total CPUE = 235.0 (22; 470)  
 PSD = 12 (2)



**2020**

Effort = 2.0  
 Total CPUE = 350.5 (18; 701)  
 PSD = 24 (3)



**2022**

Effort = 2.0  
 Total CPUE = 178.0 (19; 356)  
 PSD = 25 (5)

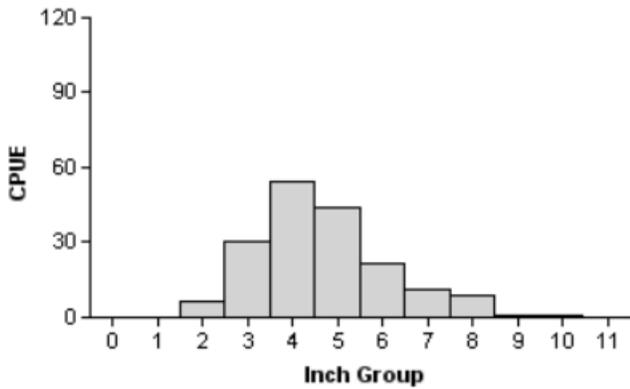
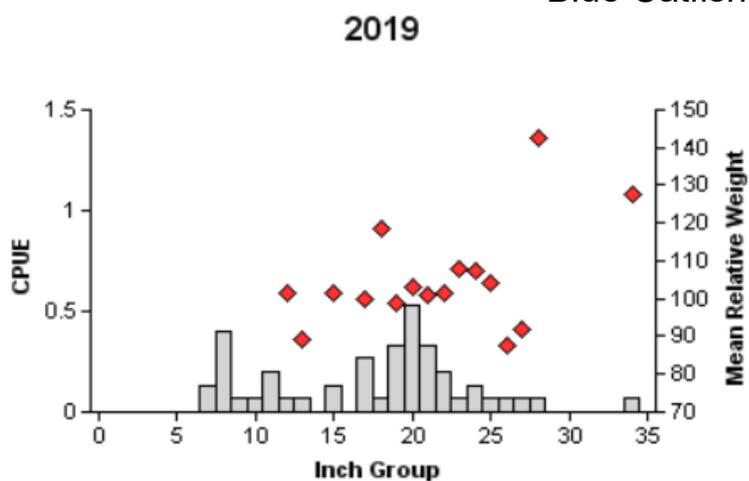
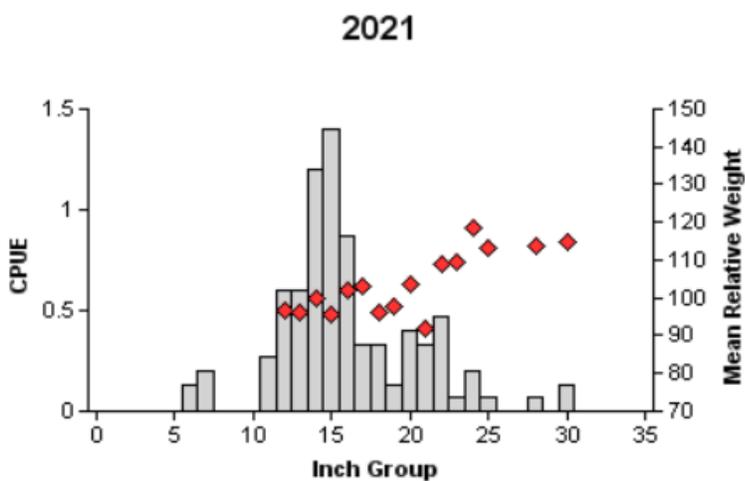


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Possum Kingdom Reservoir, Texas, 2018, 2020, and 2022.

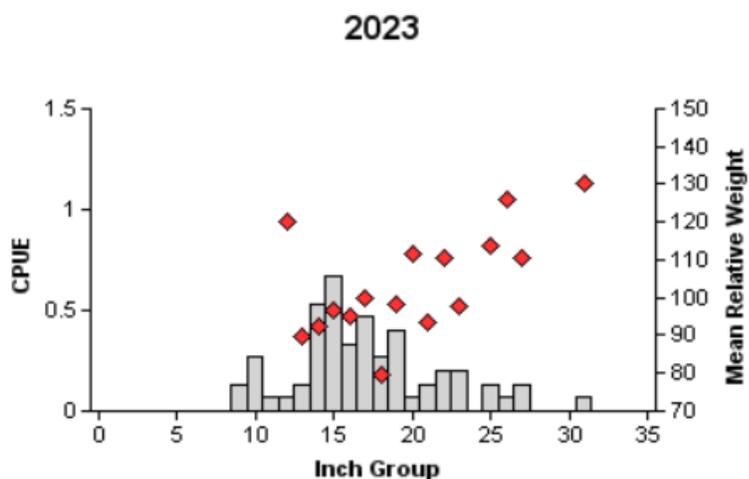
## Blue Catfish



Effort = 15.0  
 Total CPUE = 3.4 (22; 51)  
 Stock CPUE = 2.5 (24; 38)  
 PSD = 63 (7)



Effort = 15.0  
 Total CPUE = 7.8 (32; 117)  
 Stock CPUE = 7.2 (32; 108)  
 PSD = 24 (5)



Effort = 15.0  
 Total CPUE = 4.3 (19; 65)  
 Stock CPUE = 3.9 (19; 58)  
 PSD = 26 (5)

Figure 4. Number of Blue Catfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Possum Kingdom Reservoir, Texas, 2019, 2021, and 2023.

Table 10. Creel survey statistics for Blue Catfish at Possum Kingdom Reservoir, Texas, from September 2020 through May 2021. Total catch per hour is for anglers targeting Blue Catfish and total harvest is the estimated number of Blue Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year
	2020/2021
Surface area (acres)	15,588
Directed effort (h)	3,614.4 (51)
Directed effort/acre	0.2 (51)
Total catch per hour	0.0 (0)
Total harvest	1,260.9 (128)
Harvest/acre	0.1 (128)
Percent legal released	5.0



Figure 5. Length frequency of harvested Blue Catfish observed during creel surveys at Possum Kingdom Reservoir, Texas, September 2020 through May 2021, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

### Channel Catfish

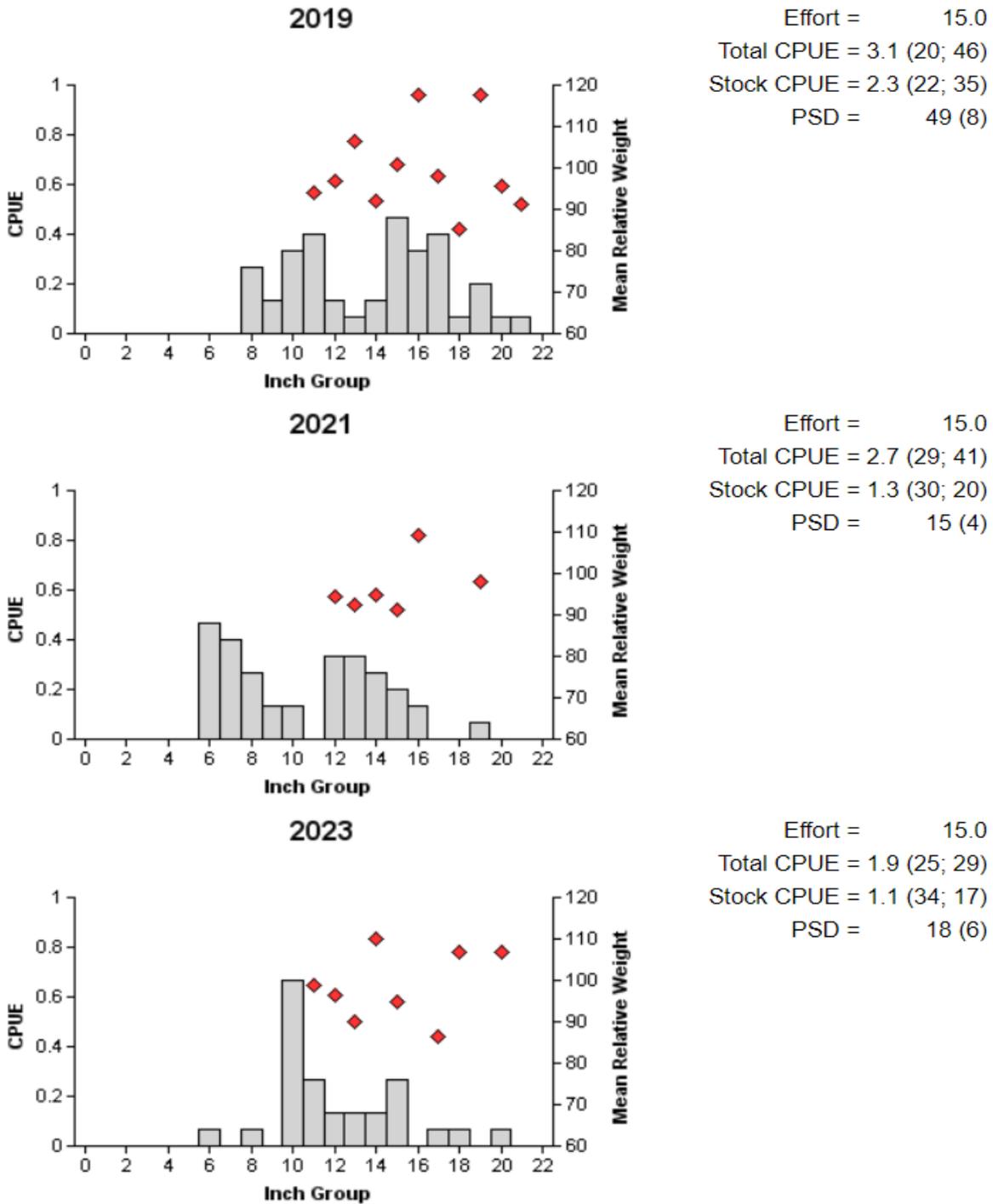


Figure 6. Number of Channel Catfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Possum Kingdom Reservoir, Texas, 2019, 2021, and 2023.

Table 11. Creel survey statistics for Channel Catfish at Possum Kingdom Reservoir, Texas, from September 2020 through May 2021. Total catch per hour is for anglers targeting Channel Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year
	2020/201
Surface area (acres)	15,588
Directed effort (h)	308.0 (139)
Directed effort/acre	<0.1 (139)
Total catch per hour	0.4 (0)
Total harvest	137.3 (372)
Harvest/acre	<0.1 (372)
Percent legal released	79.6

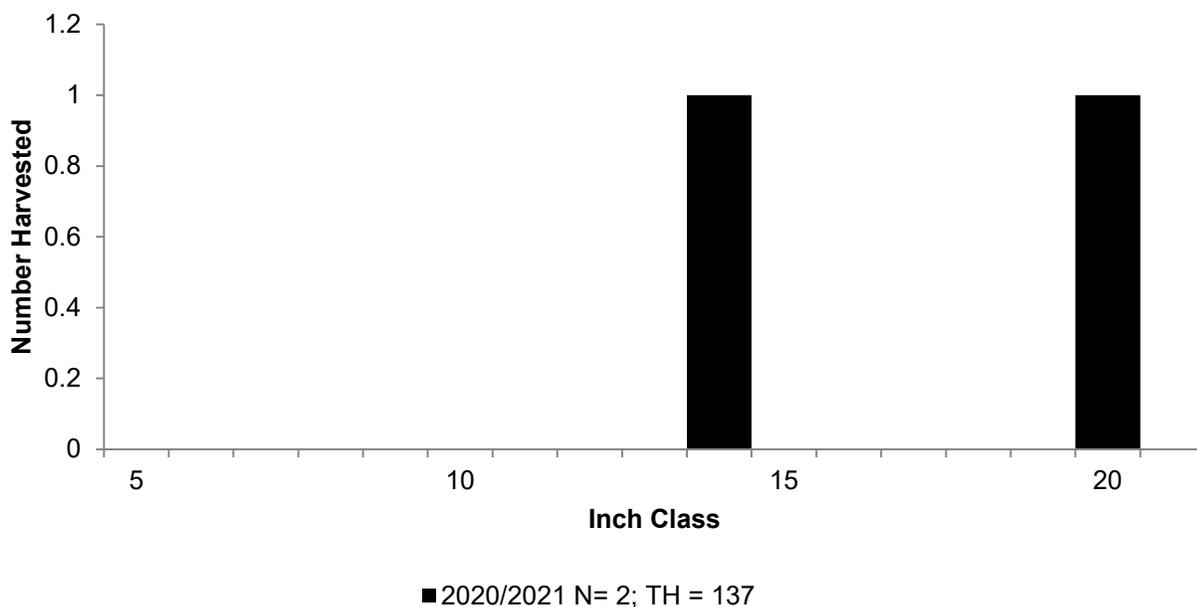


Figure 7. Length frequency of harvested Channel Catfish observed during creel surveys at Possum Kingdom Reservoir, Texas, September 2020 through May 2021, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

## White Bass

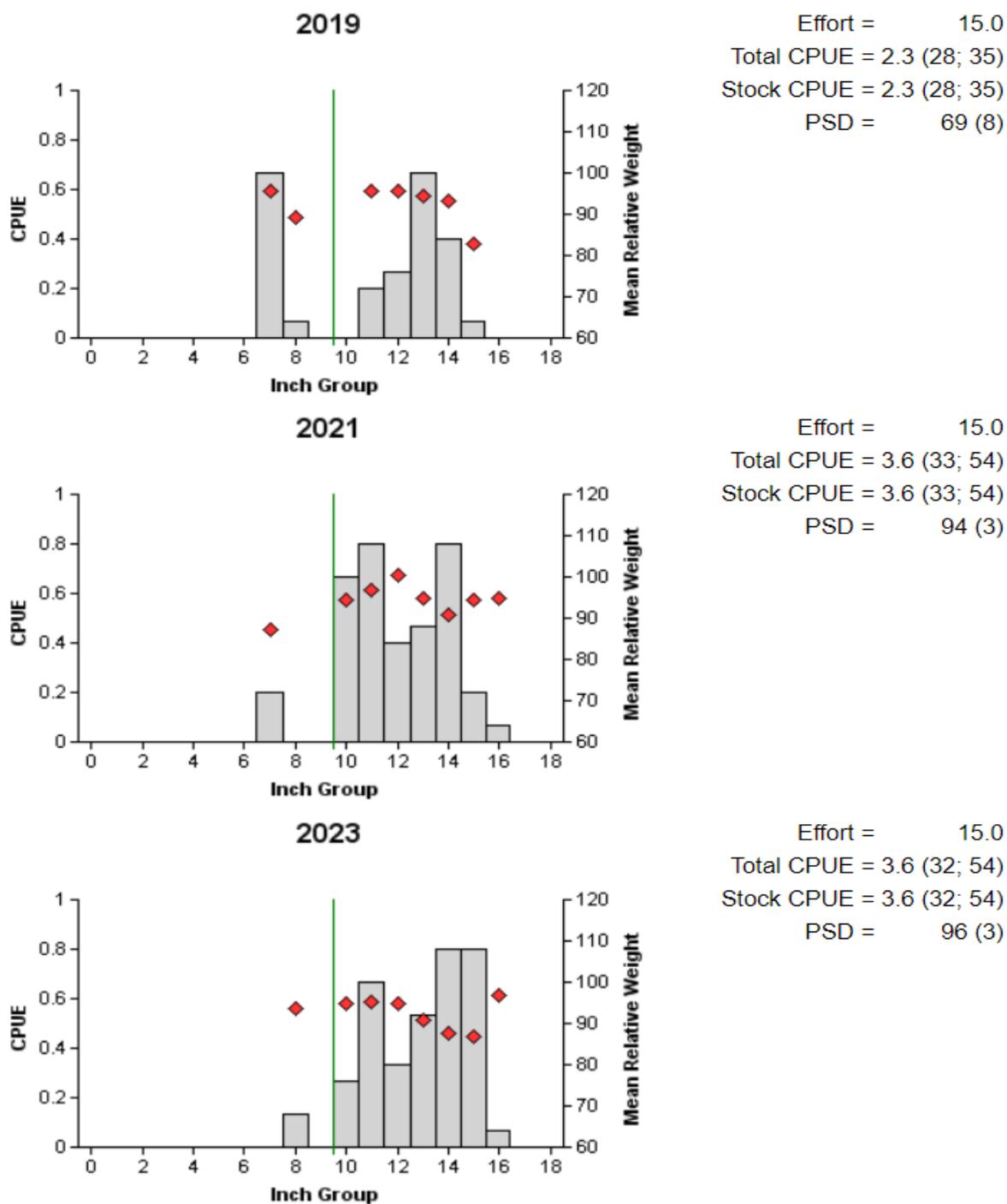


Figure 8. Number of White Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Possum Kingdom Reservoir, Texas, 2019, 2021, and 2023. Vertical line indicates minimum length limit.

Table 12. Creel survey statistics for White Bass at Possum Kingdom Reservoir, Texas, from September 2020 through May 2021. Total catch per hour is for anglers targeting White Bass and total harvest is the estimated number of White Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year
	2020/2021
Surface area (acres)	15,588
Directed effort (h)	3,558.5 (40)
Directed effort/acre	0.2 (40)
Total catch per hour	2.0 (115)
Total harvest	7,120.6 (37)
Harvest/acre	0.5 (37)
Percent legal released	71.8

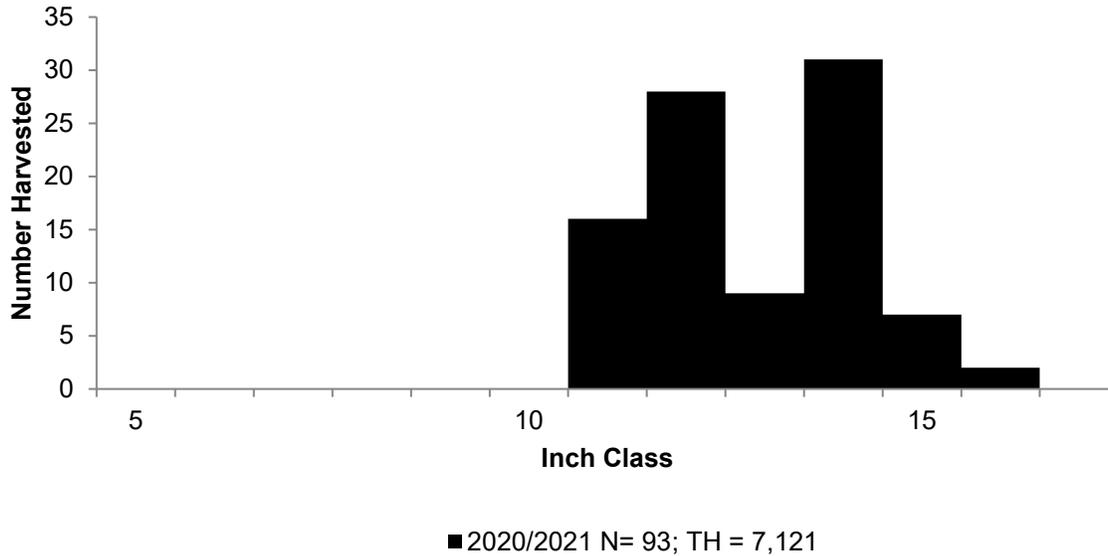


Figure 9. Length frequency of harvested White Bass observed during creel surveys at Possum Kingdom Reservoir, Texas, September 2020 through May 2021, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Striped Bass

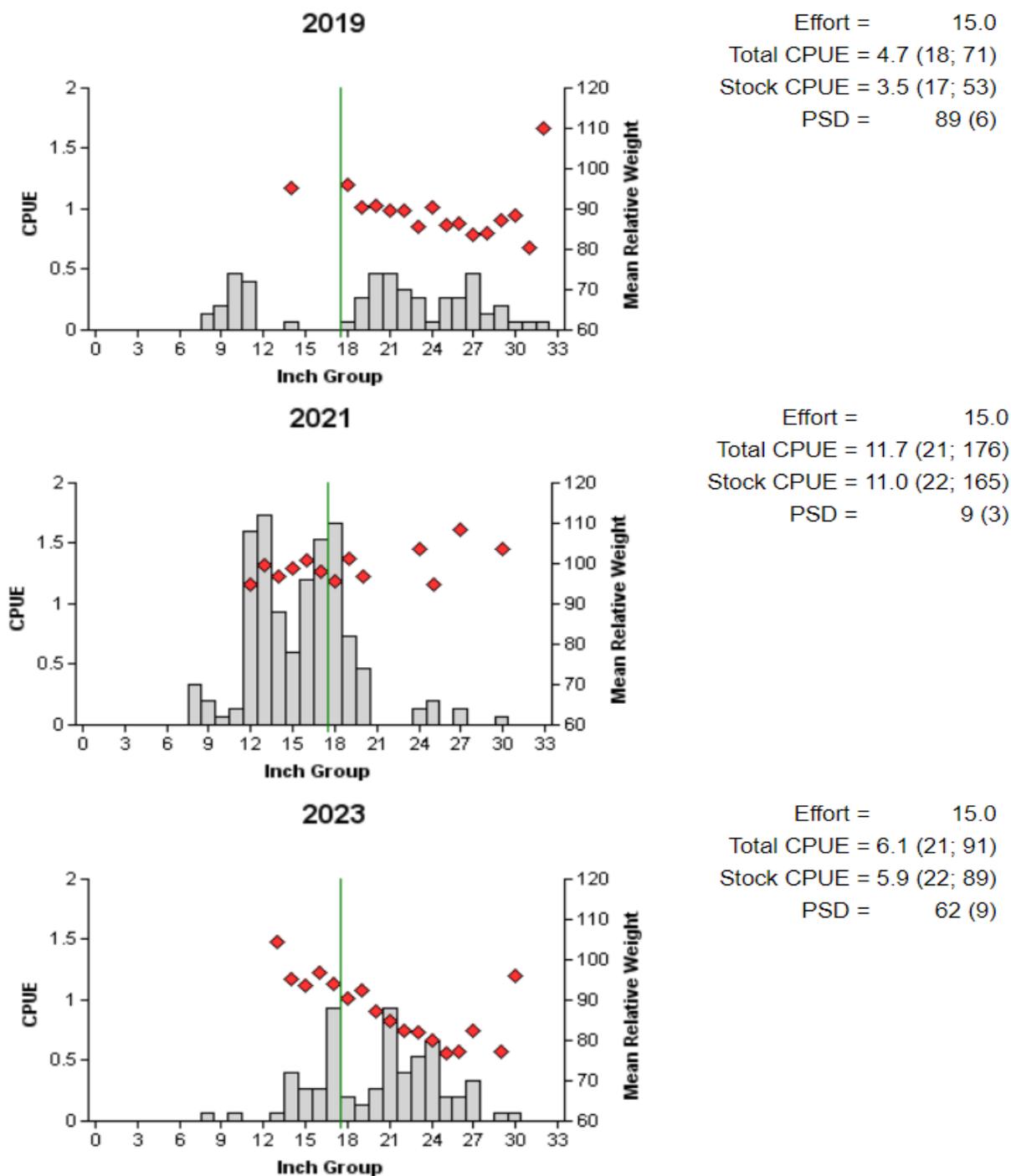


Figure 10. Number of Striped Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Possum Kingdom Reservoir, Texas, 2019, 2021, and 2023. Vertical line indicates minimum length limit.

Table 4. Creel survey statistics for Striped Bass at Possum Kingdom Reservoir, Texas, from September 2020 through May 2021. Total catch per hour is for anglers targeting Striped Bass and total harvest is the estimated number of Striped Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year
	2020/2021
Surface area (acres)	15,588
Directed effort (h)	5,837.9 (42)
Directed effort/acre	0.4 (42)
Total catch per hour	1.2 (64)
Total harvest	2,561.9 (64)
Harvest/acre	0.2 (64)
Percent legal released	47.5

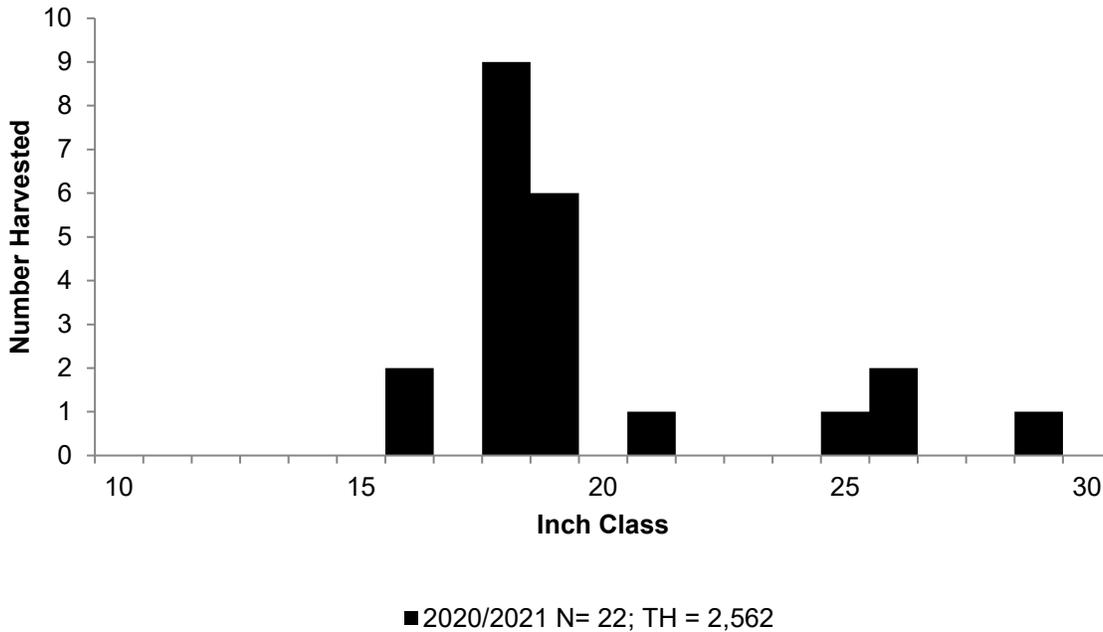


Figure 11. Length frequency of harvested Striped Bass observed during creel surveys at Possum Kingdom Reservoir, Texas, September 2020 through May 2021, all anglers combined. N is the number of harvested Striped Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

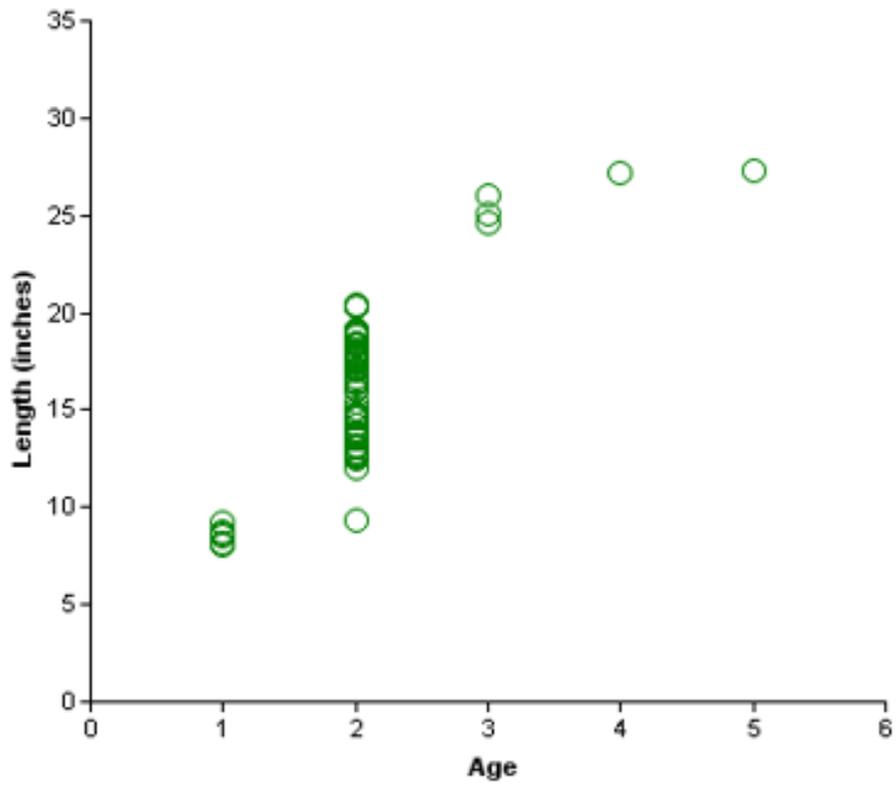


Figure 12. Length at age for Striped Bass collected from gill nets at Possum Kingdom Reservoir, Texas, March 2021.

## Largemouth Bass

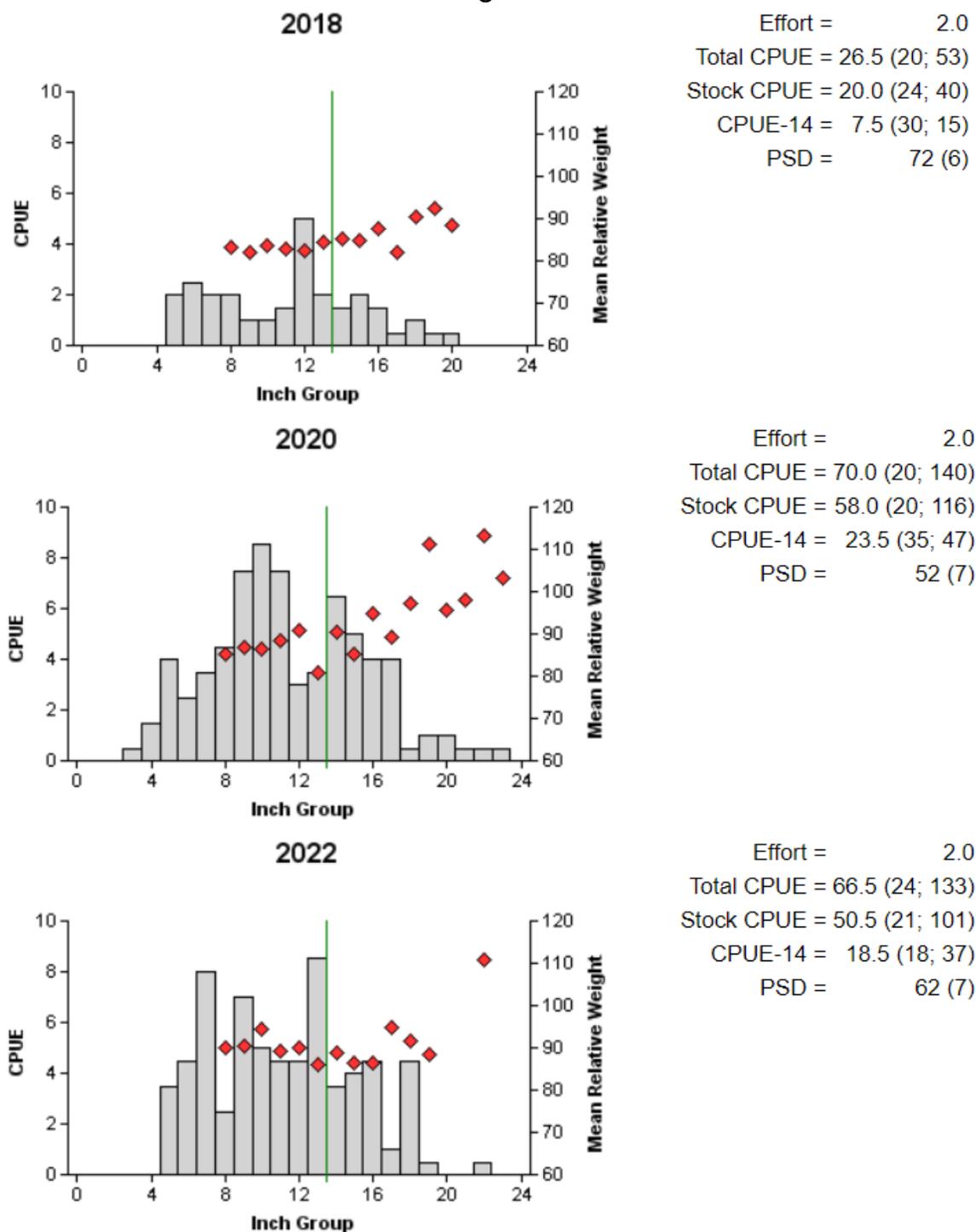


Figure 12. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Possum Kingdom Reservoir, Texas, 2018, 2020, and 2022. Vertical line indicates minimum length limit.

Table 5. Creel survey statistics for Largemouth Bass at Possum Kingdom Reservoir, Texas, from September 2020 through May 2021. Catch rate is for all anglers targeting black bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Statistic	2020/2021
Surface area (acres)	15,588
Directed angling effort (h)	
Tournament	50,921.4 (26)
Non-tournament	63,797.7 (17)
All black bass anglers combined	115,411.3 (20)
Angling effort/acre	7.4 (20)
Catch rate (number/h)	0.4 (23)
Harvest	
Non-tournament harvest	1,964.4 (47)
Harvest/acre	0.1 (47)
Tournament weigh-in and release	19,161.1 (40)
Release by weight	
<4.0 lbs.	37,313 (52)
4.0-6.9 lbs.	8,562 (61)
7.0-9.9 lbs.	1,741 (82)
≥10.0 lbs.	0 (0)
Percent legal released (non-tournament)	70.6

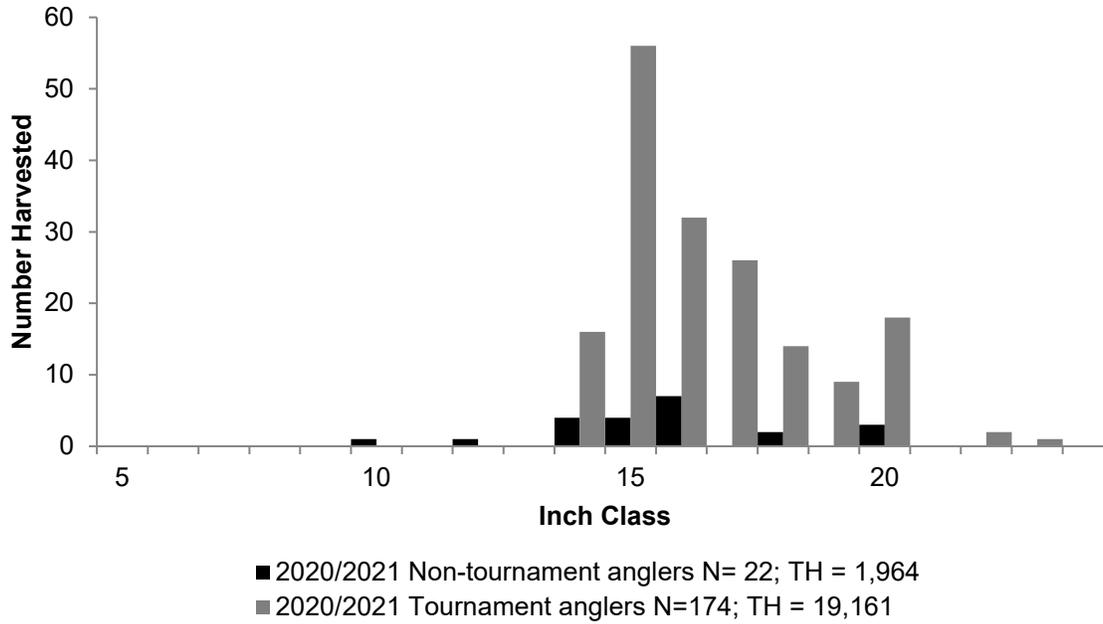


Figure 13. Length frequency of harvested Largemouth Bass observed during creel surveys at Possum Kingdom Reservoir, Texas, September 2020 through May 2021, non-tournament, and tournament anglers are shown separately. N is the number of harvested Largemouth Bass observed during creel surveys.

### White Crappie

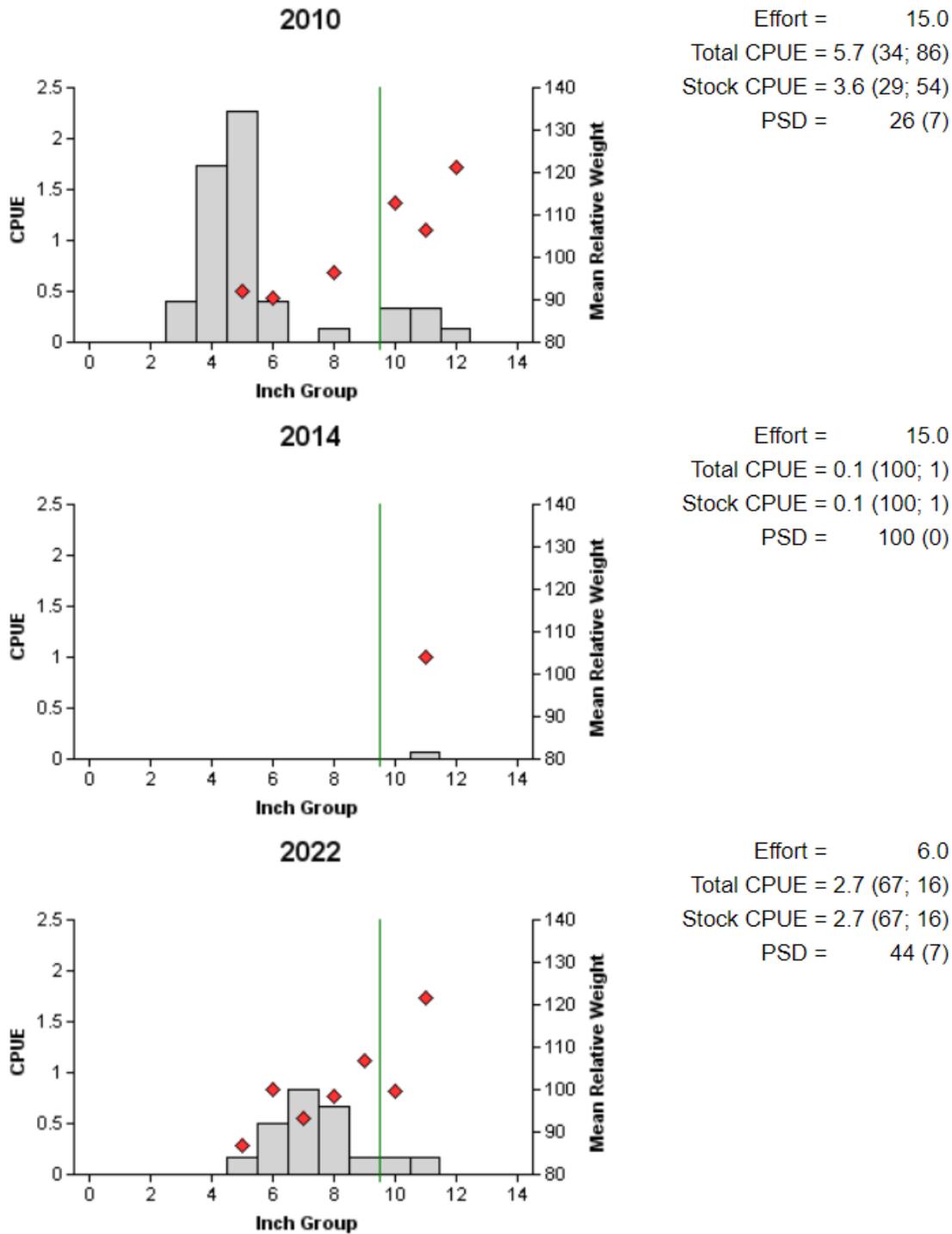


Figure 14. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Possum Kingdom Reservoir, Texas, 2010, 2014, and 2022. Vertical line indicates minimum length limit.

### Black Crappie

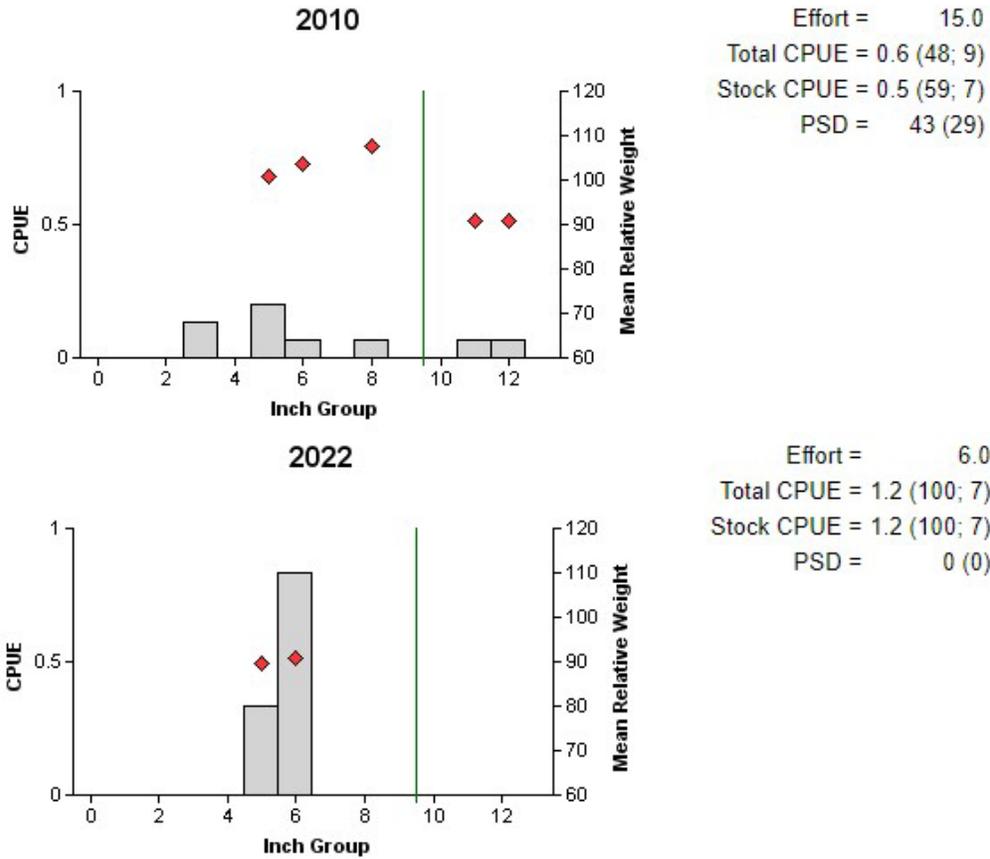


Figure 16. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Possum Kingdom Reservoir, Texas, 2010 and 2022. No Black Crappie were sampled in 2014. Vertical line indicates minimum length limit.

Table 6. Creel survey statistics for Crappie *spp.* at Possum Kingdom Reservoir, Texas, from September 2020 through May 2021. Total catch per hour is for anglers targeting Crappie *spp.* 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
	2020/2021
Surface area (acres)	15,588
Directed effort (h)	4,778.1 (45)
Directed effort/acre	0.3 (45)
Total catch per hour	0.7 (117)
Total harvest	3,355.3 (102)
Harvest/acre	0.2 (102)
Percent legal released	17.0

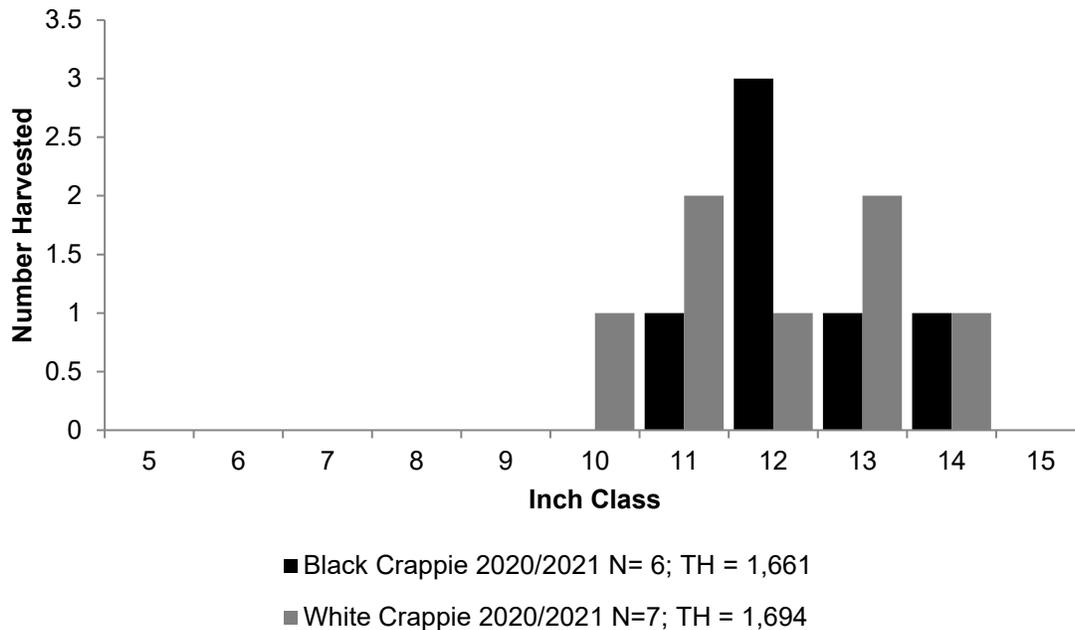


Figure 15. Length frequency of harvested Crappie *spp.* observed during creel surveys at Possum Kingdom Reservoir, Texas, September 2020 through May 2021, Black and White Crappie are shown separately. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Possum Kingdom Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall.

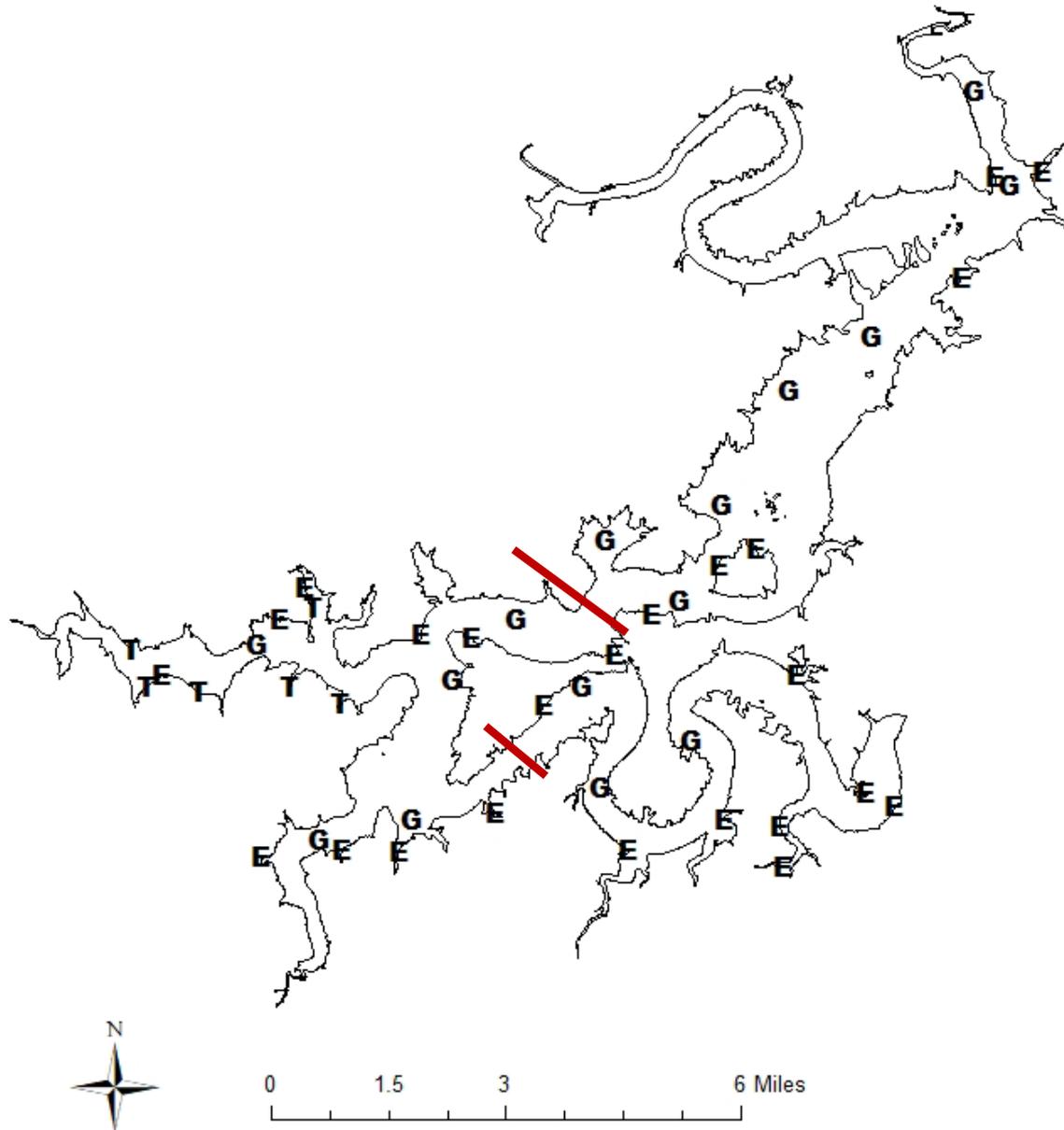
	Survey year			
	2023-2024	2024-2025	2025-2026	2026-2027
Angler Access				X
Structural Habitat				X
Vegetation				X
Electrofishing – Fall		X		X
Gill netting		X		X
Creel survey				
Report				X

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all species collected from all gear types from Possum Kingdom Reservoir, Texas, 2022-2023. Sampling effort was 15 net nights for gill netting, 6 net nights for trap netting, and 2 hours for electrofishing.

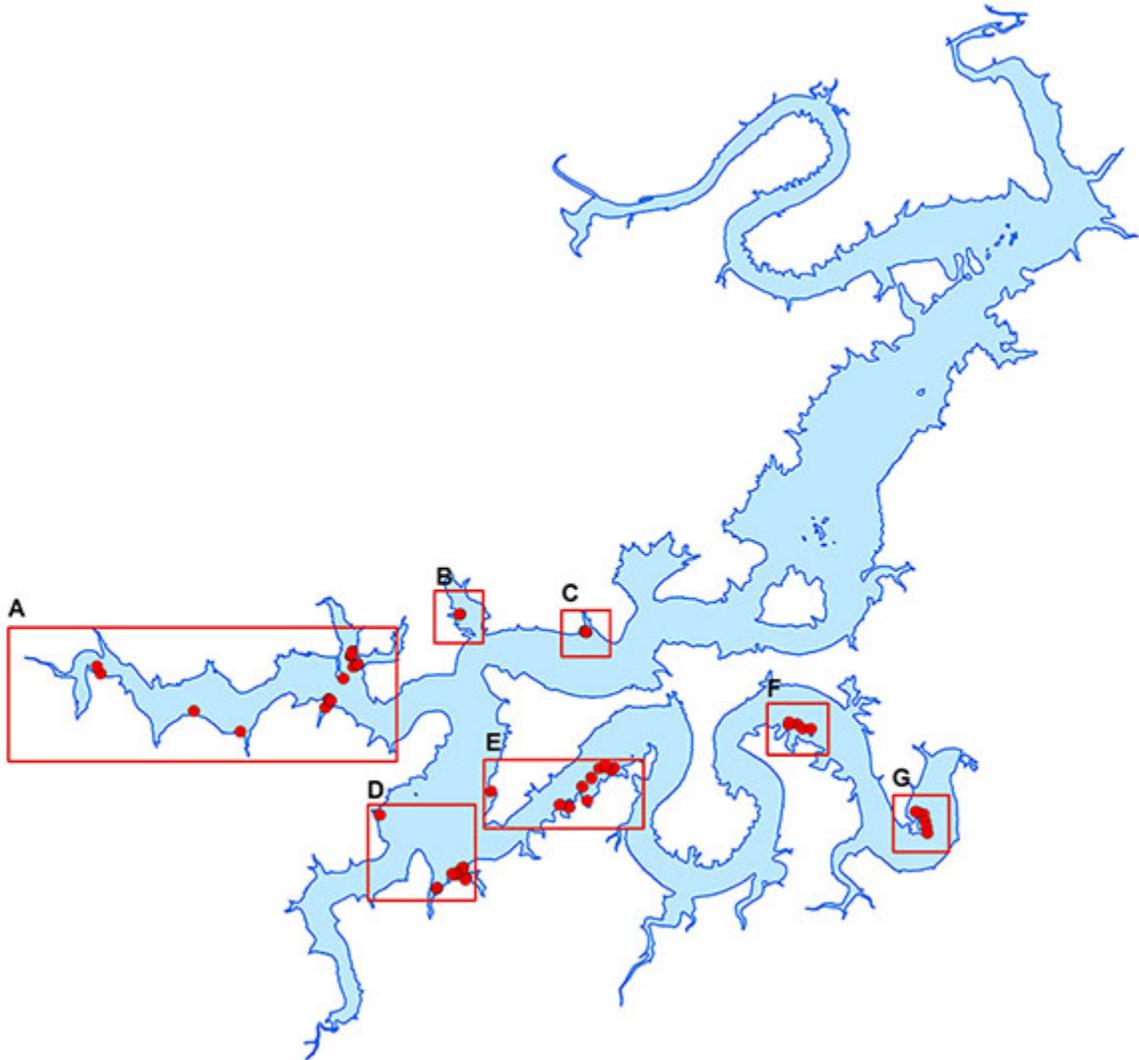
Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Longnose Gar	27	1.8 (96)				
Gizzard Shad	111	7.4 (24)			219	109.5 (18)
Threadfin Shad					40	20.0 (48)
Common Carp	13	0.9 (22)				
River Carpsucker	2	0.9 (68)				
Smallmouth Buffalo	66	4.4 (33)				
Blue Catfish	65	4.3 (19)				
Channel Catfish	29	1.9 (25)	1	0.2 (100)		
Flathead Catfish	2	0.1 (68)				
White Bass	54	3.6 (32)				
Striped Bass	91	6.1 (21)				
Hybrid Striped Bass	1	0.1 (100)				
Green Sunfish					21	10.5 (42)
Warmouth					5	2.5 (41)
Bluegill			26	4.3 (56)	356	178.0 (19)
Longear Sunfish			1	0.2 (100)	67	33.5 (51)
Redear Sunfish					3	1.5 (55)
Smallmouth Bass					3	1.5 (73)
Largemouth Bass	5	0.3 (63)			133	66.5 (24)
White Crappie	7	0.5 (46)	16	2.7 (16)		
Black Crappie	2	0.1 (68)	7	1.2 (100)		
Freshwater Drum	15	1.0 (70)				

## APPENDIX B – Map of 2022-2023 sampling locations and creel sections



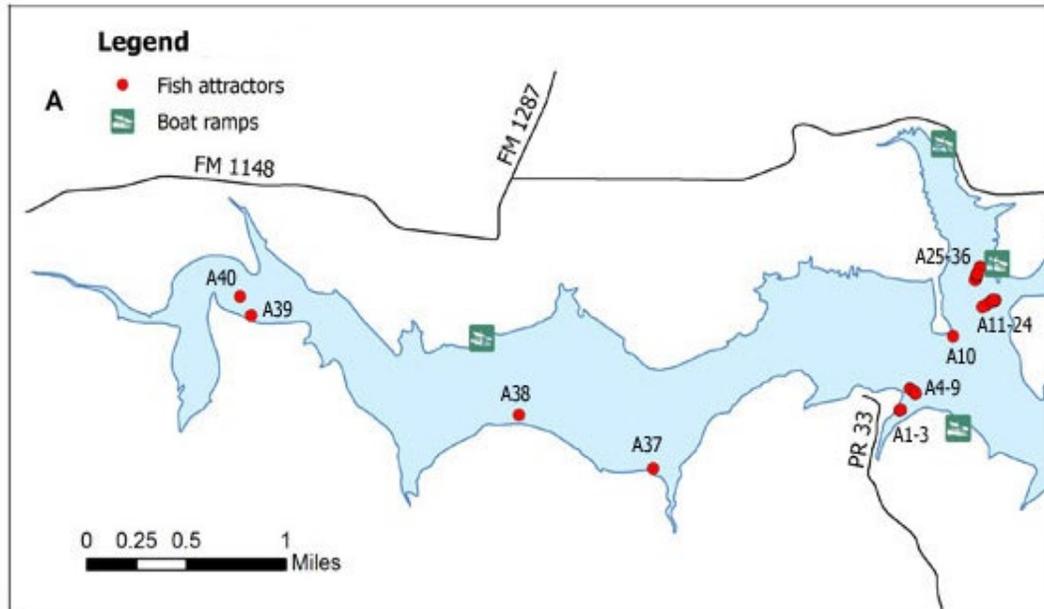
Location of sampling sites, Possum Kingdom Reservoir, Texas, 2022-2023. Gill net, Trap net and electrofishing stations are indicated by G, T and E, respectively. Water level was four feet below conservation level during the sampling period. Bold, red lines indicate creel section cut-off points.

## APPENDIX C – Locations of habitat placement



## Appendix C – Continued

## Area A – Cedar Creek Arm

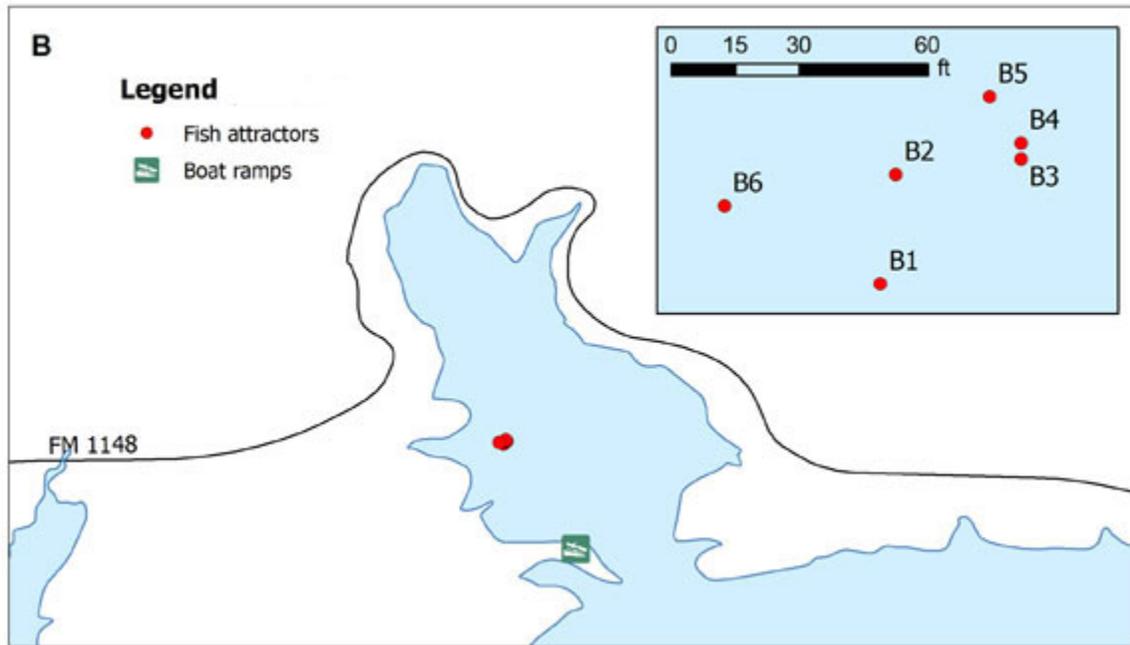


Site	Latitude	Longitude	Site	Latitude	Longitude
A1	32.88176	-98.5597	A21	32.88916	-98.55324
A2	32.88181	-98.5596	A22	32.88893	-98.55369
A3	32.88178	-98.55963	A23	32.88928	-98.553
A4	32.88326	-98.55896	A24	32.8894	-98.55285
A5	32.8829	-98.55854	A25	32.89169	-98.55384
A6	32.88323	-98.55892	A26	32.89126	-98.55406
A7	32.883	-98.55857	A27	32.89084	-98.55419
A8	32.8831	-98.55864	A28	32.89082	-98.55416
A9	32.88295	-98.55855	A29	32.89095	-98.55412
A10	32.88689	-98.55579	A30	32.89079	-98.55422
A11	32.8894	-98.55297	A31	32.89108	-98.55413
A12	32.88934	-98.55279	A32	32.89115	-98.55407
A13	32.8893	-98.55299	A33	32.89159	-98.55391
A14	32.88929	-98.55293	A34	32.89114	-98.55407
A15	32.8894	-98.55273	A35	32.89119	-98.55408
A16	32.88941	-98.55281	A36	32.8912	-98.55407
A17	32.88931	-98.55302	A37	32.87774	-98.57758
A18	32.88902	-98.55343	A38	32.88833	-98.60678
A19	32.88934	-98.55298	A39	32.88146	-98.58733
A20	32.88942	-98.5529	A40	32.88963	-98.60758

These sites were placed in 2013. A1 thru A36 are artificial habitat structures. A37 thru A40 are brush piles.

## Appendix C – Continued

## Area B – Rocky Hollow

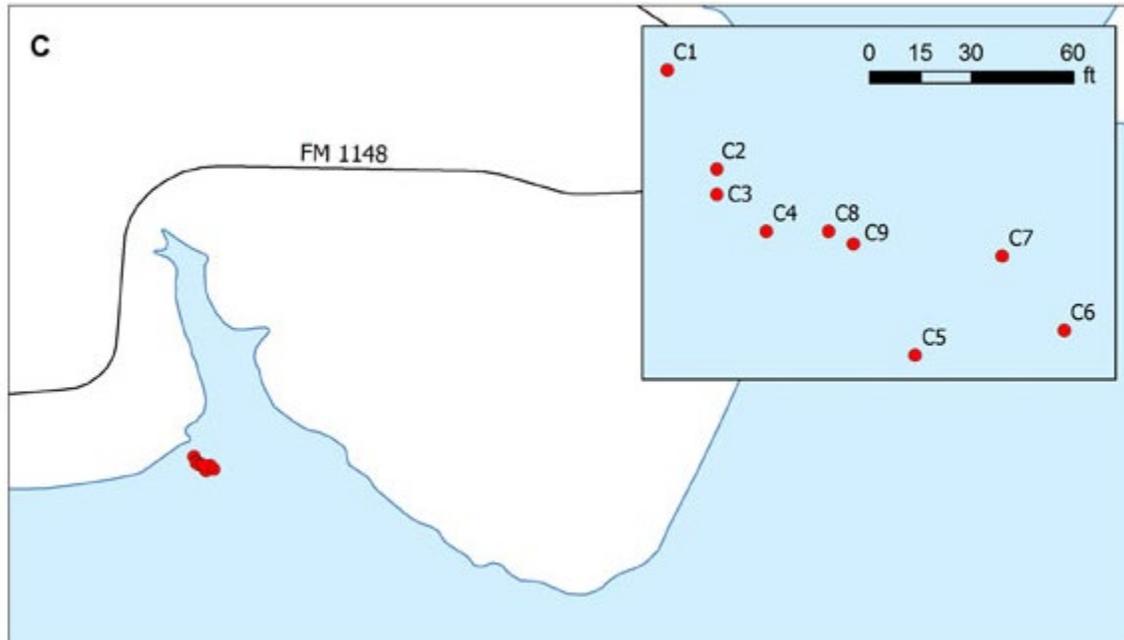


Site	Latitude	Longitude
B1	32.89794	-98.5312
B2	32.89801	-98.53119
B3	32.89802	-98.53111
B4	32.89803	-98.53111
B5	32.89806	-98.53113
B6	32.89799	-98.5313

A group of artificial habitat with each structure identified. Placed in 2016.

## Appendix C – Continued

## Area C – Peanut Patch

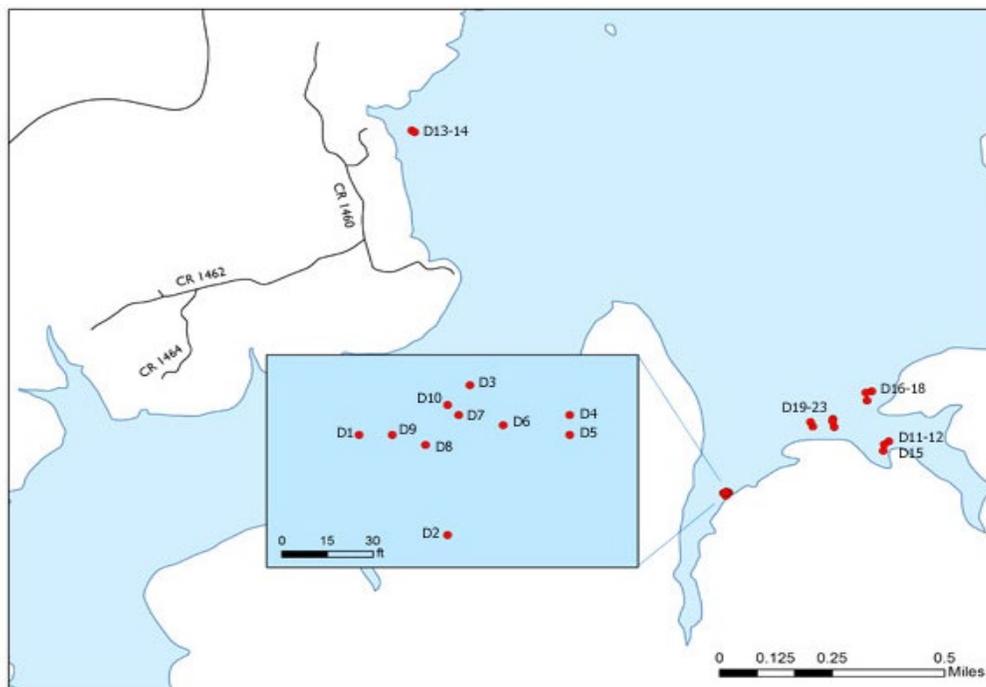


Site	Latitude	Longitude
C1	32.89472	-98.50495
C2	32.89464	-98.50491
C3	32.89462	-98.50491
C4	32.89459	-98.50487
C5	32.89449	-98.50475
C6	32.89451	-98.50463
C7	32.89457	-98.50468
C8	32.89459	-98.50482
C9	32.89458	-98.5048

A group of artificial habitat with each structure identified. Placed in 2016.

## Appendix C – Continued

## Area D – Bee Creek &amp; Long Hollow

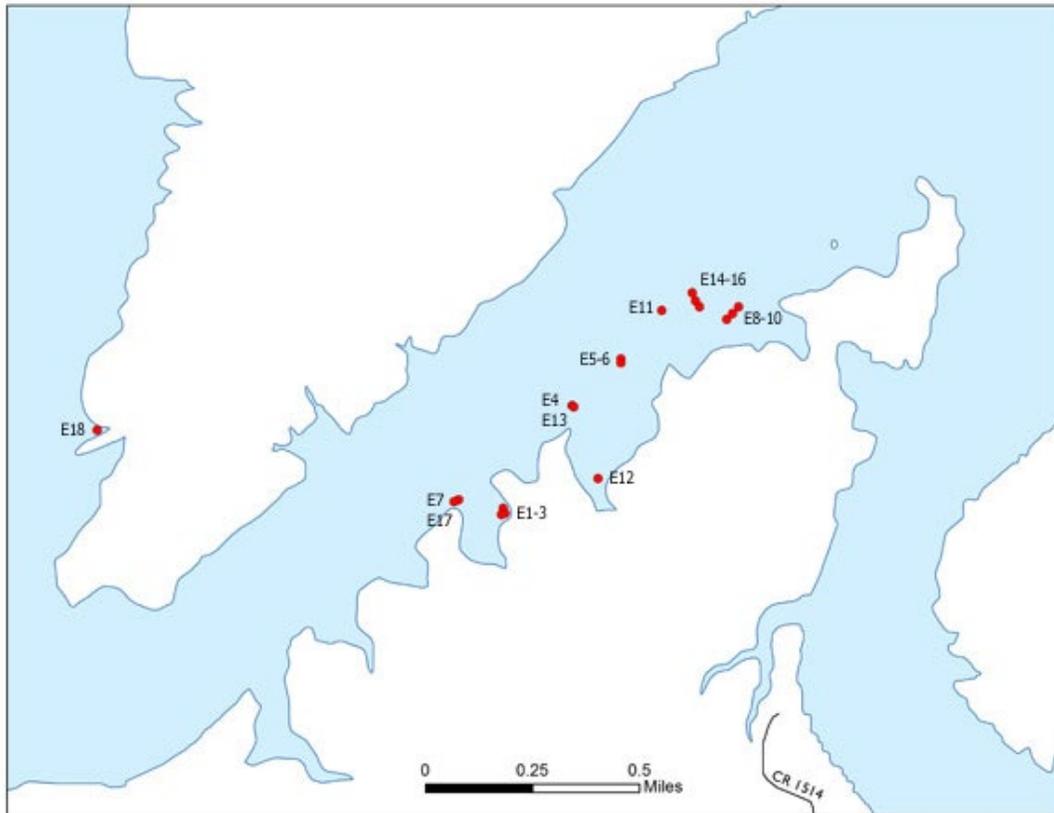


Site	Latitude	Longitude
D1	32.84954	-98.53687
D2	32.84944	-98.53679
D3	32.84959	-98.53677
D4	32.84956	-98.53668
D5	32.84954	-98.53668
D6	32.84955	-98.53674
D7	32.84956	-98.53678
D8	32.84953	-98.53681
D9	32.84954	-98.53684
D10	32.84957	-98.53679
D11	32.851324	-98.53051
D12	32.851218	-98.530699
D13	32.862696	-98.5486
D14	32.862635	-98.548501
D15	32.850983	-98.530735
D16	32.853133	-98.531141
D17	32.8528	-98.531321
D18	32.853088	-98.531366
D19	32.851861	-98.532601
D20	32.852156	-98.532646
D21	32.852066	-98.532655
D22	32.851891	-98.533421
D23	32.85205	-98.533502

D1 thru D10 are a group of artificial habitat placed in 2016. Artificial habitat was placed in 2017 at D11 thru D23. Additional artificial habitat was placed around D22 in 2021.

## Appendix C – Continued

## Area E – Lower Lake



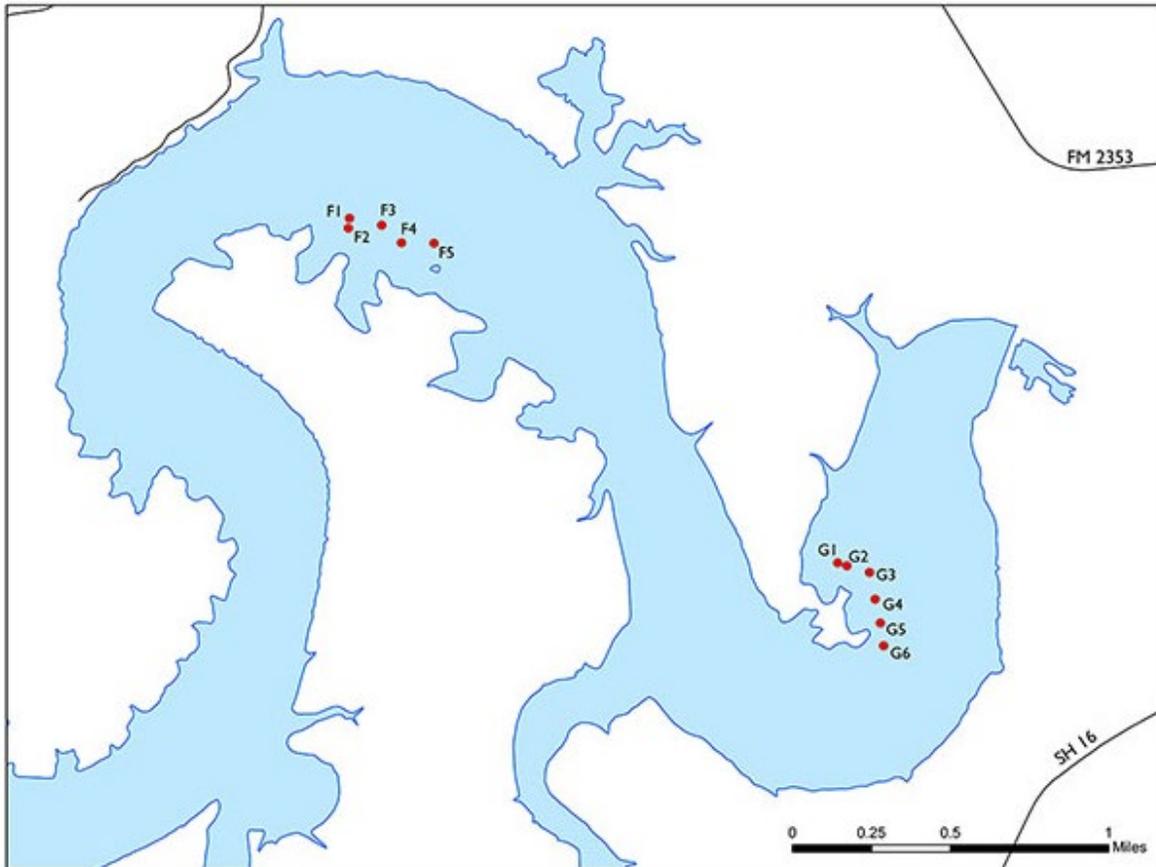
Site	Latitude	Longitude
E1	32.863718	-98.508797
E2	32.863551	-98.508715
E3	32.863514	-98.508869
E4	32.867178	-98.505975
E5	32.868737	-98.503992
E6	32.868601	-98.503983
E7	32.864036	-98.510572
E8	32.870229	-98.499468
E9	32.870024	-98.499711
E10	32.870448	-98.499233
E11	32.870365	-98.502316
E12	32.864687	-98.504966
E13	32.867132	-98.505903
E14	32.870675	-98.500955
E15	32.870471	-98.500802
E16	32.87094	-98.501081
E17	32.863975	-98.510762
E18	32.866565	-98.525057

Artificial habitat placed in 2017. Additional artificial habitat was added to E12 and E7 in 2021. Christmas trees were added to E14 and E11 in 2023.

## Appendix C – Continued

## Area F- Gaines Bend

## Area G – Frank Harris Bend

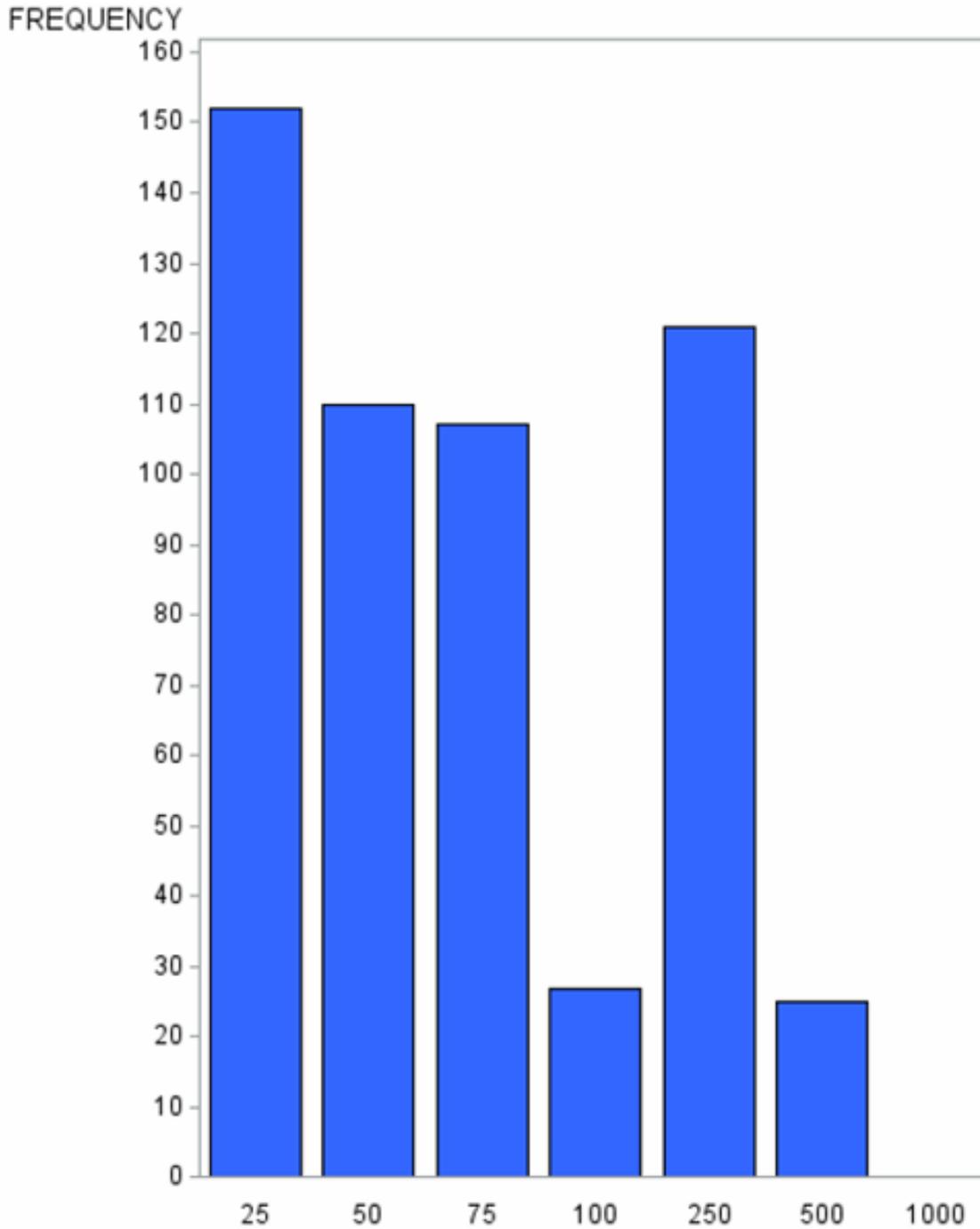


Site	Latitude	Longitude
F1	32.87763333	-98.46241667
F2	32.87808333	-98.46243333
F3	32.87773333	-98.46245
F4	32.87691667	-98.46246667
F5	32.87688333	-98.46248333

Site	Latitude	Longitude
G1	32.86191667	-98.4625
G2	32.86176667	-98.46251667
G3	32.86145	-98.46253333
G4	32.86023333	-98.46255
G5	32.85911667	-98.46256667
G6	32.85808333	-98.46258333

Artificial structures placed in 2018. Additional artificial structures were placed around G5 and G3 in 2021. In 2023 Christmas trees were placed around F1 and F3.

## APPENDIX D – Reporting of creel ZIP code data



Frequency of anglers that traveled various distances (miles) to Possum Kingdom Reservoir, Texas, as determined from the September 2020 through May 2021 creel survey.

## APPENDIX E – Historical catch rates of targeted species by gear type

Historical catch rates for targeted species by gear type for Possum Kingdom Reservoir, Texas.

Gear	Species	Year								
		1999	2000	2001	2002	2003	2004	2005	2006	2007
Gill Netting (fish/net night)	Blue Catfish	1.5		0.6	0.3	0.3	0.1	0.2	0.3	0.5
	Channel Catfish	1.5		0.3	0.7	1.3	1.5	2.7	1.9	6.3
	White Bass	2.0		0.0	3.5	13.1	10.1	11.7	6.4	3.9
	Striped Bass	9.3		6.6	2.1	5.4	1.8	2.1	0.5	2.8
Electrofishing (fish/hour)	Gizzard Shad	138.0	84.0	258.5	368.0	371.5	188.0	261.0	392.0	
	Threadfin Shad	11.5	2.0	0	23.5	0.5	13.0	0	41.5	
	Redbreast Sunfish	78.3	90.5	1.5	5.5	0	0	0	0	
	Green Sunfish	20.9	36.0	6.0	50.5	2.0	18.5	10.0	35.0	
	Warmouth	18.3	15.0	2.0	1.5	0.5	14.0	8.0	7.5	
	Bluegill	356.4	253.0	12.0	170.0	25.5	71.0	252.5	214.5	
	Longear Sunfish	24.0	9.0	5.5	82.5	14.0	53.5	3.0	56.0	
	Redear Sunfish	5.7	2.0	0.5	0.5	0.5	2.0	0	0.5	
	Smallmouth Bass	21.4	25.5	1.0	0.5	1.0	0	0	0	
	Spotted Bass	23.5	21.0	0.5	0	0	0	0	0	
	Largemouth Bass	70.0	38.0	45.0	85.0	80.5	105.5	78.5	69.0	
Trap Netting (fish/net night)	White Crappie	0.6		9.5	1.1		2.2		1.8	
	Black Crappie	0.3		0.2	0.5		0.5		0.1	

**APPENDIX E – (Continued)**

Gear	Species	Year									
		2008	2009	2010	2011	2012	2013	2014	2015	2016	
Gill Netting (fish/net night)	Blue Catfish		1.2		0.9		1.8		4.7		
	Channel Catfish		5.5		3.0		2.9		3.4		
	White Bass		10.8		5.5		6.4		1.7		
	Striped Bass		2.5		0.2		0.1		2.3		
Electrofishing (fish/hour)	Gizzard Shad	511.0		306.5		287.0		117.0		222.5	
	Threadfin Shad	7.5		2.0		15.5		1.0		60.5	
	Redbreast Sunfish	0		0		0		0		0	
	Green Sunfish	14.0		4.5		5.0		9.0		11.5	
	Warmouth	4.0		0.5		0.5		0.5		4.5	
	Bluegill	180.5		37.0		54.0		103.0		173.5	
	Longear Sunfish	13.5		29.0		5.5		3.5		11.0	
	Redear Sunfish	2.0		4.0		0.5		6.5		9.5	
	Smallmouth Bass	0		0		0		0		0	
	Spotted Bass	0		0		0		0		0	
	Largemouth Bass	49.0		53.5		23.5		34.0		59.0	
	Trap Netting (fish/net night)	White Crappie	3.2		5.7				0.1		
		Black Crappie	0.5		0.6				0		

**APPENDIX E – (Continued)**

Gear	Species	Year							Mean	
		2017	2018	2019	2020	2021	2022	2023		
Gill Netting (fish/net night)	Blue Catfish	2.0		3.4		7.8		4.3	1.9	
	Channel Catfish	2.5		3.1		2.7		1.9	2.6	
	White Bass	5.5		2.3		3.6		3.6	5.6	
	Striped Bass	3.9		4.7		11.7		6.1	3.9	
Electrofishing (fish/hour)	Gizzard Shad		252.0		295.5		109.5		260.1	
	Threadfin Shad		6.0		49.5		20.0		15.9	
	Redbreast Sunfish		0		0		0		11.0	
	Green Sunfish		54.5		22.5		10.5		19.4	
	Warmouth		3.0		4.5		2.5		5.4	
	Bluegill		235.0		350.5		178.0		166.7	
	Longear Sunfish		19.5		55.5		33.5		26.2	
	Redear Sunfish		2.0		11.5		1.5		3.1	
	Smallmouth Bass		0		0		1.5		3.2	
	Spotted Bass		0		0		0		2.8	
	Largemouth Bass		26.5		70.0		66.5		59.6	
	Trap Netting (fish/net night)	White Crappie						2.7		2.9
		Black Crappie						1.2		0.8

## APPENDIX F – ShareLunker Program Entries per year

Class	Year						Total
	2018	2019	2020	2021	2022	2023 <sup>a</sup>	
<b>Legacy</b> (≥ 13 lbs.)					3	1	4
<b>Elite</b> (10.0 lb. to 12.99 lb.)	1	1		1	2	5	10
<b>Lunker</b> (8.0 lb. to 9.99 lb.)	3	5	1	5	5	12	31

<sup>a</sup>The 2023 data is only thru July 2023.



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