

Kirby Reservoir

2021 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

From 2017-2021, fish populations in Kirby Reservoir were surveyed by various methods including electrofishing, low-frequency electrofishing, tandem hoop netting, trap netting, and jug lining. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: Kirby Reservoir is a 740-acre impoundment at conservation pool located within Abilene, Texas. The reservoir is an impoundment on Cedar Creek within the Brazos River Basin. From 2017-2022, the reservoir's water level fluctuated. Water level declined from 2017 until about spring 2018 when heavy rains kept the reservoir at or above conservation pool until about summer 2019 when the water level declined about 4 ft. Heavy rains in 2020 and 2021 resulted in large increases in water level and were followed by rapid water level declines. Water level was -4 ft. by April 2022. Predominant habitat features consisted of mud flats, rocks, brush, and vegetation mostly consisted of bulrush, cattails, flooded terrestrial vegetation, and exotic salt cedar. One boat ramp and one handicap-accessible fishing pier were available during the survey period, and bank-fishing access was plentiful.

Management History: Sport fish include Blue Catfish, Channel Catfish, Flathead Catfish, White Crappie, Largemouth Bass, and sunfishes. All sport fishes, except for Blue and Channel catfishes, were managed under statewide harvest regulations. In 2021, Blue and Channel catfishes harvest regulations were modified to allow for harvest without a minimum length limit and a daily bag limit of 25 fish/day in combination with no more than 5 fish ≥ 20 inches TL and no more than 1 ≥ 30 inches total length (TL).

Fish Community

- **Prey species:** Gizzard Shad catch rates were good and fluctuated during the survey period, but the 2021 rate was similar to that reported in 2016. The Index of Vulnerability were low and consistent with prior surveys. Bluegill catch rates fluctuated during the survey period but overall increased since 2016. During the same period, size structure was increasingly represented by larger fish (i.e., 5-6 inches TL). Longear Sunfish catch rates increased during the survey period. Green sunfish catch rates declined during the survey period. Overall, the prey base is sufficient to support the sportfishes within Kirby Reservoir.
- **Catfishes:** Blue Catfish total catch rates in gill net surveys were consistent to prior surveys. Catch rates of stock length fish decreased, but catch rates of fish ≥ 20 inches TL were similar. In 2021, lengths ranged from 6-30 inches TL. Body conditions were fair to excellent and improved with body length. Channel Catfish total and stock catch rates in tandem hoop net and gill net surveys fluctuated during the survey period. Catfishes supported the most popular fishery among anglers (about 86% overall effort) during the 2019-2020 creel survey. Most legal Blue Catfish (about 75%) and Channel Catfish (about 71%) caught by anglers were released.
- **Largemouth Bass:** Largemouth Bass total catch rates fluctuated during the survey period but overall increased. Catch rates of legal Largemouth Bass remained low. In the recent sample there were more smaller fish represented compared to prior surveys. Anglers reported 2.5% of the total fishing effort targeting Largemouth Bass during the 2019-2020 creel survey. About 64% of legal Largemouth Bass caught by anglers during the creel survey were released.
- **White Crappie:** White Crappie total and stock catch rates increased substantially during the survey period. Legal fish increased in surveys during the monitoring period. Lengths ranged from 7-11 inches TL, and body conditions were good. Anglers allocated 1.6% of the total fishing effort targeting White Crappie during the 2019-2020 creel survey. About 56% of legal White Crappie caught during the creel survey were released.

Management Strategies: Surveys to be conducted include low-frequency electrofishing in spring 2025, tandem hoop netting in summer 2025, electrofishing and trap netting in fall 2025, and gill netting in spring 2026. Vegetation and access surveys will be conducted during summer 2025. Improvements to shoreline-based angler access will be discussed with the controlling authority and other potential partners.

Introduction

This document is a summary of fisheries data collected from Kirby Reservoir in 2017-2021. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2017-2021 data for comparison.

Reservoir Description

Kirby Reservoir is a 740-acre impoundment (at conservation pool) located within the city limits of Abilene, Texas and is controlled by the City of Abilene. The reservoir is in Taylor County and is an impoundment on Cedar Creek within the Brazos River Basin. Primary reservoir water uses included non-potable municipal water supply, water storage, and recreation. From 2017-2022, the reservoir's water level fluctuated during the survey period (Figure 1). Specifically, the reservoir's water level declined from 2017 until about spring 2018 when heavy rains kept the reservoir at or above conservation pool until about summer 2019 when the water level declined about 4 ft. Heavy rains in 2020 and 2021 saw large increases in water level and were followed by rapid drops in water level to about -4 ft. by April 2022 (USGS 2022)..

Angler Access

Two public boat ramps were available at Lake Kirby Park. However, one ramp was inaccessible and in need of repair. Bank access was ample, and an ADA-accessible fishing pier was available inside Lake Kirby Park. Boat ramp characteristics are detailed in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Homer and Goldstrohm 2018) included:

1. Conduct a creel survey from 2019-2020 to determine directed angling effort, harvest, and expenditures for the fishery. Obtain creel information from passive gear anglers to assess fishing effort, harvests, releases, and demographics.

Action: A roving creel survey was conducted from March 2019 – February 2020. Additional questions were asked to anglers interviewed during the survey regarding use of passive gears.

2. Continue to monitor growth of Blue and Channel Catfish by using otoliths for age estimation.

Action: Blue Catfish were collected in 2021 as part of a statewide research effort to assess growth, recruitment, and mortality.

3. Work with City of Abilene to develop a plan to implement potential strategies for improving angler access, aesthetics, and road conditions in the reservoir. Seek funding and in-kind collaborations for habitat enhancement projects to improve shoreline habitat conditions.

Action: TPWD Inland Fisheries – Abilene met with City of Abilene on several occasions to discuss access enhancement needs and other needed improvements. TPWD also participated on a focus group with other stakeholders to help develop the Lake Kirby Nature Park and discuss development of the Lake Kirby Park master plan which included shoreline-based access improvements and habitat enhancements.

4. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.

Action: Updated signage to inform the public of invasive zebra mussels and proper clean, draining, and drying of boats to prevent their spread was installed at the public boat ramp in 2019 and has since been maintained.

5. Educate the public about invasive species with media and the internet. Make a speaking point about invasive species when presenting to constituent and user groups.

Action: Popular press articles were written during the survey period, as well as speaking points were provided during media interviews to discuss the threats of invasive species. Multiple presentations were given to several groups, and they were provided speaking points regarding threats of invasive species. Social media outlets were used to share information about invasive species news and other information.

Harvest regulation history: Prior to September 2011, all sport fishes were managed with the statewide harvest regulations. Catfish harvest regulations were changed to allow harvest of Blue Catfish and Channel Catfish without a minimum length limit, and the bag limit was increased from 25 to 50 fish in combination, with no more than 5 fish/day at 20 inches or greater. In 2016, an unlawful ordinance that prohibited use of trotlines and juglines for fishing was redacted by City of Abilene. In September 2021, the previous bag limits and length limits were changed for Blue and Channel Catfish to a 25 fish/day, no minimum length limit with no more than 5 fish \geq 20 inches TL and only 1 fish \geq 30 inches TL. Other sport fishes are still managed with the statewide harvest regulations (Table 3).

Stocking history: The most recent stockings in Kirby Reservoir were Florida Largemouth Bass fingerlings in 2014 and 2016. Saugeye were stocked periodically from 1993–2011. The complete stocking history for the reservoir from 2000–2022 is described in Table 4.

Vegetation/habitat management history: Vegetation and habitat management has been limited to few projects involving construction and deployment of artificial habitat and recycled Christmas trees.

Water transfer: Treated effluent water is pumped into the reservoir from a City of Abilene-owned water treatment plant to help maintain the water supply. One pigging station from the Abilene water plant from O.H. Ivie Reservoir (Colorado River Basin) is located upstream on Cedar Creek (Brazos River Basin), which this station is operated infrequently.

Methods

From 2017-2021, surveys were conducted to achieve objectives as well as an objective-based sampling (OBS) plan for Kirby Reservoir (Table 5; Homer and Goldstrohm 2018). All survey sites were randomly selected (see APPENDIX A). All surveys except the jug lining survey were conducted according to the TPWD Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Electrofishing – During fall 2021, electrofishing was conducted for 1 hour at 12, 5-min stations, and Gizzard Shad, sunfishes, and Largemouth Bass were collected. Catch per unit effort (CPUE) for each sampled species was recorded as the number of fish caught per hour (fish/h) of electrofishing.

Gill netting – During spring 2020, Blue and Channel Catfish were collected by using experimental gill nets (20 net nights at 20 stations). Catch per unit effort (CPUE) for gill netting was recorded as the number of fish caught per net night (fish/nn). Otoliths were retained from 274 Blue Catfish as part of a research study to evaluate age, growth, recruitment, and mortality of these species at various reservoirs across Texas.

Trap netting – During late fall 2021, White Crappie were collected by using single-cod trap nets (10 net nights at 10 stations). Catch per unit effort (CPUE) for trap netting was recorded as the number of fish caught per net night (fish/nn). During 2021, ages for White Crappie were determined by using otoliths from 32 fish that were 4.6-10.4 inches.

Tandem hoop netting – Channel Catfish were collected during a baited tandem hoop netting survey conducted during summer 2021 (5 tandem series for two-night sets at 5 random stations). Catch per unit effort (CPUE) was recorded as the number of fish caught per tandem series set (fish/tandem series).

Jug lining – Blue Catfish were collected by a jug lining survey conducted during winter and spring 2020. Juglines baited with cut Common Carp were deployed in pairs, (100 pairs; jugs setup with two 1-ft. leaders spaced about 2 ft. apart, and one jug was rigged with 5/0 circle hooks and the other with two 7/0 circle hooks) approximately 10-15 yards apart at randomly selected stations in depths ≥ 6 ft., set for about 18-24 hours, and then they were retrieved. Catch per unit effort (CPUE) was recorded as the number of fish caught per jugline pair (fish/jugline pair). Otoliths from 15 fish were retained for supplementing the sample for the growth study.

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

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and body condition indices [relative weight (Wr)] 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 = $100 \times \text{SE of the estimate/estimate}$) was calculated for all CPUE statistics

Habitat – During summer 2021, vegetation was surveyed by circumnavigation of the reservoir and the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

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

Results and Discussion

Creel: During the 2019-2020 roving creel survey, anglers reported spending about 50,152 h fishing at Kirby Reservoir. Bank anglers accounted for 85.7% (42,980 h) of the total reported fishing effort. Similar to prior creel surveys, catfishes were the most popular species group targeted by anglers (76.0%), followed by fishing for anything (19.1%), Largemouth Bass (2.5%), White Crappie (1.6%), Bluegill (0.7%), and Common Carp (0.1%; Table 5). Most anglers encountered during the creel survey were living within 25 miles of the reservoir (see APPENDIX E).

Habitat: A structural habitat survey was last conducted during summer 2014 (Homer and Goldstrohm 2014). Vegetation encountered during the summer 2021 survey consisted primarily of emergent vegetation (114 acres) and dead terrestrial vegetation (94 acres; Table 6, Figure 2). Notable emergent vegetation that was observed was bulrush, cattails. Other less common (<1 acre) habitat features included stumps and flooded timber. Approximately 9 acres of exotic salt cedar was observed along the shoreline and within the lakebed. Exotic giant reed (*Arundo donax*) was also observed within Lake Kirby Park, but it was not within the lakebed or along shoreline.

Prey species: Bluegill, Gizzard Shad, Longear Sunfish, and Green Sunfish, have been common in the reservoir and comprised most of the available fish prey base for sport fish in the reservoir. Other prey species encountered during survey period included Orangespotted Sunfish, hybrid sunfishes, and Common Carp (see APPENDIX B). Gizzard Shad catch rates fluctuated from 526.0/h in 2016 to 218.0/h in 2017 to 503.0/h in 2022 (Figure 3). Gizzard Shad consistently had IOV values >90 during the survey period, thus most individuals were desired prey sizes. Desired precision of relative abundance estimates of sunfishes were not achieved, though the desired minimum samples were achieved to evaluate size structure for Bluegill. Catch rates of Bluegill fluctuated from 175.0/h in 2016 to 475.0/h in 2017 to 311.0/h in 2021 (Figure 4). CPUE for Bluegill \geq stock length fluctuated from 165.0/h in 2016 to 475.0/h in 2017 to 301/h in 2021. Bluegill PSDs increased from 3 in 2017 to 60 in 2021, and the recent sample was comprised of fish mostly 5-6 inches. Longear Sunfish total catch rates increased over the survey period from 25.0/h in 2016 to 92.0/h in 2021 (Figure 5). Green Sunfish catch rates fluctuated from 157.0/h in 2016 to 201.0/h in 2017 to 39.0/h in 2021 (Figure 6). Prey species have been prolific in Kirby Reservoir, and relative abundance estimates suggest prey continue to be ample and available to support sport fishes (see APPENDIX C).

Blue Catfish: Since 2012, gill netting produced similar catch rates that ranged from 22.4-25.2/nn (Figure 7). Catch of individuals \geq stock length declined from 19.6/nn in 2014 to 10.2/nn in 2021; gill netting was not conducted in 2018. Catch of individual \geq 20 inches TL were mostly consistent and ranged from 3.5-4.2/nn. Mean relative weights were ideal, appeared to increase with length for up to 20 inches TL, and ranged from 92-119 among the represented inch groups. A spring low-frequency electrofishing survey was not conducted because of poor sampling conditions due to high winds and conflicts associated with the COVID-19 pandemic. Three jugline surveys have been conducted at Kirby Reservoir since 2009. Jugline CPUE-Total fluctuated from 0.3/jugline pair in 2009 (Neely and Dumont, unpublished data), to 0.9/jugline pair in 2018, to 0.5/jugline pair in 2021. In the 2021 jugline survey, fish ranged from 9-28 inches TL, which was a smaller size range than reported during the 2018 survey (Figure 8). Aged Blue Catfish ranged from 1-20 years old (see APPENDIX D). Many fish between 9-11 inches were 5-7 years old. During the 2019-2020 creel survey, 2,610.5 Blue Catfish were estimated to be harvested and 7,983.9 fish were released (Table 9). During the creel survey, 62 Blue Catfish were observed harvested and they ranged from 7-30 inches TL (Figure 8).

Channel Catfish: Channel Catfish have been productive in Kirby Reservoir and have been an important species targeted by anglers (Homer and Amoroso 2014). Gill net total catch rates fluctuated from 7.0/nn in 2012 to 20.8/nn in 2014 to 9.5/nn in 2021; similar fluctuations in stock CPUE were observed (Figure 10). Precision of Channel Catfish catch rates and sample sizes of fish \geq stock length were poor during the surveys. Summer tandem hoop net surveys have typically produced greater catches of fish \geq stock length. Tandem hoop net total catches fluctuated from 72.3/tandem series in 2017 to 19.0/tandem series in 2019 to 27.4/tandem series in 2021 (Figure 11). Stock CPUE declined from 36.8/ tandem series in 2017 to 6.0/tandem series in 2021. Target precision of CPUE estimates was not achieved in either 2019 or 2021. Size structure, as indicated by PSD, was consistently low and ranged from 0-7, and most individuals sampled were $<$ quality-size. During the 2019 and 2021 surveys, target sample sizes of fish \geq stock length were not achieved to effectively evaluate body conditions. During the 2019-2020 creel survey, anglers reported targeting Channel Catfish specifically for 1,028 h (Table 10). About 2,463 fish were harvested, and 6,102 fish were released during the creel period. During the creel survey, 77 Channel Catfish were observed harvested and ranged from 8-18 inches TL (Figure 12).

Flathead Catfish: A scheduled low-frequency electrofishing survey was not conducted during summer 2020 because conflicts involving the COVID-19 pandemic and poor sampling conditions attributed to winds. Flathead Catfish were present in other surveys, but they were not enumerated. Anglers did not report specifically targeting Flathead Catfish during the 2019-2020 creel survey, and no fish were observed as harvested.

Largemouth Bass: The total catch rate of Largemouth Bass fluctuated from 29.5/h in 2016 to 18.0/h in 2017 to 46.0/h in 2021 (Figure 13). Catch rates for stock-size fish fluctuated from 7.4/h in 2016 to 17.0/h in 2017 to 13.0/h in 2021. Only one legal length fish was caught in the fall 2021 survey. Fish that were sampled had adequate body conditions (i.e., $W_r > 95$). Sizes of Largemouth Bass collected during 2021 ranged from 4-16 inches, which most individuals were small and $<$ stock length. Anglers reported targeting Largemouth Bass for about 1,256 h during the 2019-2020 creel survey. Approximately 42 fish were estimated to be harvested, and about 555 fish were released (Table 11). Only one 21-inch Largemouth Bass was observed as harvested during the creel survey. One ShareLunker Elite Class Largemouth Bass was submitted during the 2018-2022 monitoring period.

White Crappie: Since 2015, White Crappie catch rates substantially increased from 2.7/nn to 34.7/nn in 2017 to 92.4/nn in 2021 (Figures 15 and 16). Target sampling precision of CPUE estimates for White Crappie was not achieved during the fall 2021 sample. However, the sample size in 2021 was substantially higher than the previous two surveys and with lower sampling effort. Increases in catch rates were observed for stock and legal (i.e., CPUE-10) fish during the monitoring period which suggest improved recruitment over the sampling period. Specifically, CPUE-10 for White Crappie increased from 0.5/nn in 2015 to 4.7/nn in 2017 to 20.4/nn in 2021. Sizes of White Crappie in the 2021 survey ranged from 3-11 inches, which most individuals were 7-10 inches. Proportional size distribution increased from 34 in 2017 to 67 in 2021. Catch

rates of legal crappie were greater than recent surveys (Figure 16). The substantial increase in catch suggest that the population likely experienced optimal reproduction and recruitment which may be attributed to the increased availability of vegetation and structural habitat from relatively consistent water level. Mean relative weights were sufficient and ranged from 86-114. Anglers reported approximately 817 h of fishing effort to target White Crappie. About 210 fish were harvested and 339 were released, which about 91% of legal fish were released (Table 12). Five White Crappie were observed as harvested and ranged from 11-12 inches TL.

Fisheries Management Plan for Kirby Reservoir

Prepared – July 2022

ISSUE 1: In 2021, a new regulation was enacted to increase protection of larger Blue and Channel Catfish in Kirby Reservoir. The regulation allows for no minimum length limit, 25 daily bag limit (in combination), with no more than 5 fish \geq 20 inches and no more than 1 \geq 30 inches. Monitoring of the fishery is necessary to identify any changes to the populations and/or the quality of angling at the reservoir.

MANAGEMENT STRATEGIES

1. Conduct an exploratory, spring low-frequency electrofishing and jug lining to monitor Blue Catfish relative abundance, body conditions, population size structure, and growth.
2. Conduct tandem hoop netting for monitoring Channel Catfish relative abundance, population size structure, body conditions, and growth.

ISSUE 2: Lake Kirby Park is the primary access location for fishing at the reservoir. Angler access is hindered from poor road conditions, littering, and area closures by the controlling authority. Bank anglers contribute the most fishing effort at the reservoir, and improvements are needed to provide adequate access to the fishery.

MANAGEMENT STRATEGY

1. Work with City of Abilene and other stakeholders to develop and implement strategies to improve angler access, aesthetics, and stewardship at Kirby 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 Texas.

MANAGEMENT STRATEGIES

1. Cooperate with City of Abilene to post appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through media outlets.
3. Make speaking points about invasive species when presenting to constituent and user groups.
4. Monitor existing and future inter-basin water transfers to facilitate potential invasive species responses.

ISSUE 4: Golden alga (*Prymnesium parvum*) presence was documented during winter 2014. While it has not produced a toxic algal bloom, its presence is a threat to existing fisheries.

MANAGEMENT STRATEGY

1. Conduct routine monitoring during winter months (December-March) to collect water quality data and to determine golden alga cell densities and toxicity.

Objective-Based Sampling Plan and Schedule (2022–2026)

Sport fish, forage fish, and other important fishes: Species that have comprised the sport fish community include Blue Catfish, Channel Catfish, Flathead Catfish, Largemouth Bass, and White Crappie. The prey fish community consists primarily of Gizzard Shad, Bluegill, Green Sunfish, and Longear Sunfish, but Orangespotted Sunfish, sunfish hybrids, Inland Silversides, Common Carp, Smallmouth Buffalo, and various minnow species are also present. The proposed sampling schedule is in Table 13.

Low-density fisheries: Saugeye were once present in Kirby Reservoir, but they have not been stocked since 2011. No Saugeye have been caught in monitoring surveys since 2014.

Flathead Catfish: Flathead Catfish are managed with the statewide 18-inch MLL and five-fish daily bag limit. Previous creel surveys have suggested that anglers seldom target Flathead Catfish, but creel survey efforts may have not been effective at capturing the anglers that typically target them because they have anecdotally been reported to fish at night. Since Kirby Reservoir is a popular catfish fishery (56-80% overall angling effort), Flathead Catfish likely provide additional opportunities for anglers to catch larger bodied fish. A mark-recapture study was conducted from fall 2014–spring 2015, and the population was estimated to have 512 individuals (95% CI= ± 450) ≥ 20 inches by using the Schnabel population estimator. A specific survey for Flathead Catfish will not be planned during this monitoring cycle, but they will be enumerated and measured for evaluating CPUE and length frequency without precision or sample targets during surveys targeting Blue and Channel Catfish.

Survey objectives, fisheries metrics, and sampling objectives:

Prey Species: Gizzard Shad and sunfishes (e.g., Bluegill, Green Sunfish, and Longear Sunfish). Traditional monitoring of prey species has been conducted by nighttime electrofishing for 1.0 hour at 12, 5-minute randomly selected stations. Sampling for one hour has produced adequate precision of relative abundance for Gizzard Shad and sunfishes, though sunfish are much more variable. However, sample sizes are generally large enough to evaluate size structure for most common prey species. Electrofishing will be conducted during fall 2025 to monitor prey species' relative abundance (i.e., CPUE-Total) and size structures. To obtain a current estimate for Index of Vulnerability for Gizzard Shad, ≥ 50 fish will be collected. To evaluate the size structure for Bluegill as Proportional Size Distribution (PSD), 50 fish \geq stock length will be attempted to be collected. If desired precision for Bluegill and Gizzard Shad relative abundance estimates and/or sample sizes are not achieved, no additional sampling will be conducted.

Catfishes: Catfishes (i.e., Blue Catfish, Channel Catfish, and Flathead Catfish) have been the most targeted sport fish group by anglers at Kirby Reservoir. Anglers directed more angling effort towards catfishes than any other species group during March 2019 – February 2020 creel survey (85.7% of overall effort). In September 2021, harvest regulations for Blue and Channel Catfish were changed to increase protection for larger individuals by enacting no minimum length limit, and maximum daily bag limit of 25/day with no more than 5/day ≥ 20 inches and no more than 1/day ≥ 30 inches. The prior daily bag limit for Blue and Channel Catfish were reduced, as prior creel surveys indicated that no anglers reported harvesting the 50/day that was previously allowed by Kirby Reservoir special regulation. Monitoring Blue and Channel catfishes is crucial to ensure adequate management of the catfish fishery.

Blue Catfish: Of all catfishes found in Kirby Reservoir, Blue Catfish are most targeted by anglers and are abundant in the reservoir (Homer and Amoroso 2014). Monitoring data have typically been collected by gill netting, though low-frequency electrofishing and paired baited jug lining surveys have also been used to monitor relative abundance, size structure, body conditions, and growth. Greater total catch of Blue Catfish

has been achieved with late spring or early summer low-frequency electrofishing surveys, though results have been variable, and ability to sample with this method is difficult because of seasonal winds. Prior attempts to use low-frequency electrofishing during the late summer and early fall typically resulted in greater presence of smaller individuals and poor catch of larger fish. Spring gill netting catch rates have been more consistent, though representation of the larger individuals (i.e., ≥ 20 inches) in the population has been poor. Supplementing gill netting samples with jug lining has been effective at obtaining data for catfishes ≥ 16 inches. Gill netting during spring 2026 (5 random stations, 5 net nights) will be conducted to monitor Blue Catfish. Precision of recent CPUE estimates (i.e., 2012-2021) has varied with relative standard errors (RSE) ranging from 14-22%, thus a desired target will be $RSE \geq 25$ for CPUE-Total and stock CPUE; CPUE-20 and CPUE-30 estimates will have no targets for precision given historical difficulty to achieve desirable precision. Fifty Blue Catfish \geq stock-size will be sampled to evaluate size structure (i.e., PSD), and ≥ 5 fish per represented inch group ≥ 12 inches will be needed to assess body condition (i.e., relative weight). Up to 5 additional gill nets may be necessary to achieve objectives. Jug lining will be conducted to monitor Blue Catfish to monitor larger individuals. Jug lines baited with cut Common Carp on either two 5/0 or 7/0 circle hooks will be set in pairs at 50 random stations overnight for 18-24 hours and retrieved. A target sample of ≥ 50 fish will be attempted. Up to 25 additional jug pairs may be set to achieve the desirable sample. Relative abundance (CPUE-Total and CPUE-20 as fish/jug pair) will be calculated for Blue Catfish caught; no target level of precision will be attempted. An exploratory low-frequency electrofishing survey may be attempted during spring 2025 if the sampling schedule and environmental conditions allow. No target objectives for data precision or sample size will be set for the exploratory survey.

Channel Catfish: Channel Catfish are relatively abundant in Kirby Reservoir, and they support the popular catfish fishery at the reservoir. However, individuals are stunted and catch rates among gill nets and tandem hoop nets have been variable. Tandem hoop netting has been attempted multiple times to develop a trend monitoring dataset. Tandem hoop net surveys in Kirby Reservoir have often caught more Channel Catfish than gill nets and have had similar representations of size structures. Tandem hoop netting surveys have consisted of deploying 3-9 tandem series over two nights and have yielded greater sample sizes but variable catches (37.7-101.3/tandem series) and inconsistent levels of precision ($RSE=10-53\%$). Despite the variable catch rates and levels of precision for relative abundance estimates, tandem hoop net sampling has been effective in providing adequate sample sizes to evaluate size structure and relative weights. Historical surveys have been conducted with nets baited with either cheese logs or soap bait, and surveys where soap was used have typically produced greater catches. Soap will be used as the preferred bait for the foreseeable future. Channel Catfish sampling will be conducted during late spring or early summer 2025 by deploying, five tandem series baited with soap to monitor trends in relative abundance, size structure, relative weight and growth. Desired precision of CPUE-Total and Stock CPUE will have a target $RSE \leq 30$. A minimum of 50 fish \geq stock-length to evaluate size structure as PSD, and 5 fish from each represented inch group ≥ 11 inches will be collected to evaluate body condition (i.e., mean relative weights). If additional sampling is warranted to achieve the previously mentioned objectives, up to four additional tandem series may be set. Monitoring of Channel Catfish during gill netting will be conducted for these parameters, though targets for data precision will not be set.

Largemouth Bass: Largemouth Bass support a small fishery at the reservoir. Anglers reported allocating 2.5% of the directed fishing effort reported in the 2019-2020 creel survey towards Largemouth Bass. While the directed fishing effort is low for Largemouth Bass, about 19% of anglers surveyed in the 2019-2020 creel survey reported fishing for "anything". Largemouth Bass likely provide fishing opportunities for these "anything" anglers, especially since a large majority of anglers are bank anglers. Electrofishing CPUE-Total has been variable, likely attributed fluctuations in water level and available habitat as well as predator

densities. Recruitment of Largemouth Bass has been traditionally low and variable (Homer and Goldstrohm 2018). Monitoring trends in relative abundance is necessary for this fishery to provide status updates to constituents and determine future management strategies. During fall 2025, sampling will be conducted at 12, 5-minute randomly selected stations for a total of one hour of sampling effort. Relative abundance (CPUE-Total, Stock CPUE, and CPUE-14) will be calculated, but no target levels of precision will be attempted because attaining precisions $RSE < 25$ for CPUE estimates would require impractical effort. Body condition (i.e., relative weight) will be evaluated if a sample of \geq five fish per inch group \geq stock-size are obtained. Evaluation of size structure by determining PSD will be attempted if a sample size of 50 fish \geq stock length is achieved. Given that this is a lower priority fishery for this reservoir, additional sampling will not be conducted if sample sizes for evaluating size structure and body condition are not achieved.

White Crappie: White Crappie relative abundance has been typically low, but the catch of fish in the 2021 trap net survey increased substantially. Abundance of White Crappie appears to be linked to water level and habitat availability. In the 2019-2020 creel survey, anglers reported directing 1.6% of the overall fishing effort targeting White Crappie. Despite the low directed effort and poor catch rates, periodically monitoring the trends of relative abundance will allow for TPWD fish biologists to better inform constituents on the status of the fishery. To monitor White Crappie, a trap netting survey will be conducted during fall 2025 by deploying single-cod trap nets among 5 randomly selected stations for one night and retrieved the following day. Relative abundance (CPUE-Total, Stock CPUE, and CPUE-10) will be calculated without a target for precision. A sample of 50 fish \geq stock length will be collected to evaluate size structure (i.e., PSD). At least five fish per inch group \geq stock length will be weighed to evaluate body condition as relative weight. Additional sampling will not be conducted if objectives are not met.

Creel: A creel survey was last conducted from March 2019 – February 2020. A creel survey will not be conducted during this monitoring cycle.

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Tables and Figures

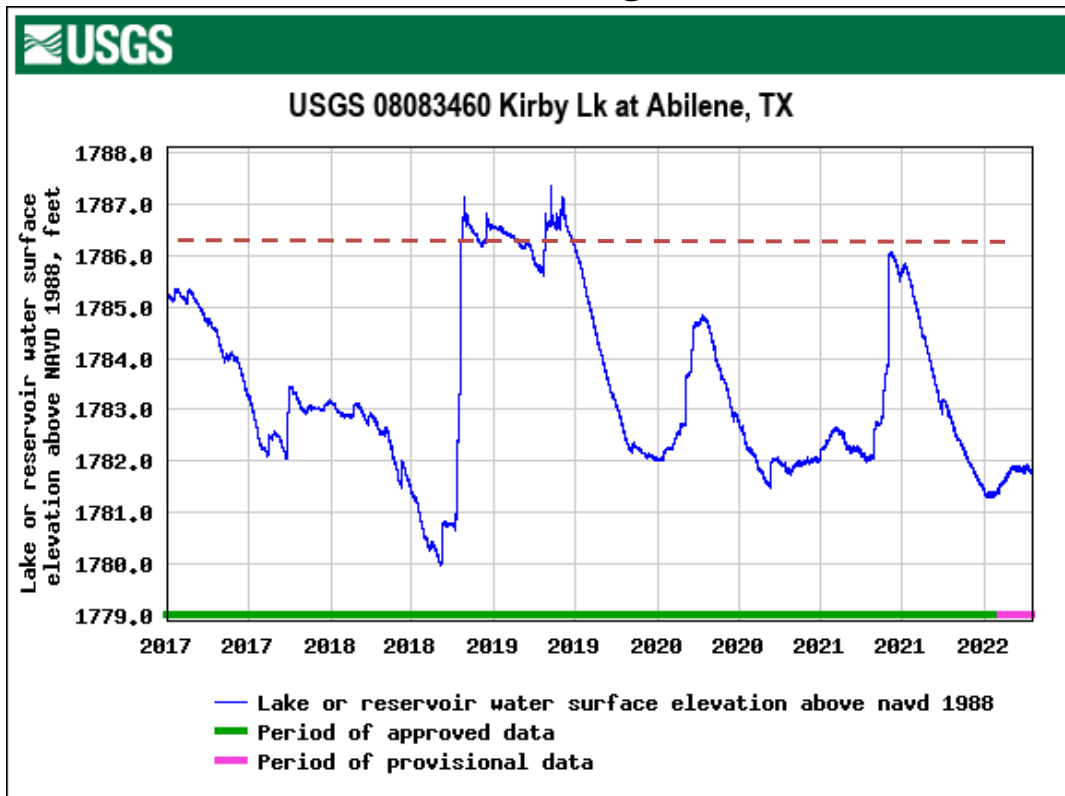


Figure 1. Mean daily water level elevations in feet above mean sea level (MSL) recorded for Kirby Reservoir, Texas, January 1, 2017- May 1, 2022 (USGS 2022). Dashed line represents conservation pool elevation.

Table 1. Characteristics of Kirby Reservoir, Texas.

Characteristic	Description
Year Constructed	1928
Controlling Authority	City of Abilene
County	Taylor
Reservoir Type	Tributary
HUC River Basin ¹	Brazos (120601)
HUC Sub-basin ¹	Upper Clear Fork Brazos (12060102)
Watershed ¹	Elm Creek (1206010207)
Sub-watershed ¹	Upper Cedar Creek (120601020708)
Conservation Pool Elevation	1,786 ft above mean sea level
Conductivity Range ²	902 – 3,123 μ S/cm
Secchi Disc Range	0.6-1.7 ft

¹UGSG Hydrologic Unit Code (HUC)

²Conductivity was inversely related to water level.

Table 2. Boat ramp characteristics for Kirby Reservoir, Texas, May, 2022. Reservoir elevation at time of survey was three feet below conservation pool elevation.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	End of Ramp Elevation (ft. above MSL)	Condition
Kirby Park Ramp #1	32.38335° -99.72982°	Y	10	1,775	Accessible; good condition
Kirby Park Ramp #2	32.38018° -99.72960°	Y	5	1,779	Inaccessible; repair needed

Table 3. Harvest regulations for Kirby Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue, their hybrids and subspecies	25 (in any combination)	No more than 5 ≥20 inches; no more than 1 ≥30 inches
Catfish, Flathead	5	18-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum
Saugeye	3	18-inch minimum

Table 4. Stocking history of Kirby Reservoir, Texas, 2000-2022. FRY = fry; FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

Species	Year	Number	Size
Threadfin Shad	2002	300	ADL
Golden Shiner	2000	100	ADL
Bluegill	2001	475	ADL
	2001	370,196	FGL
	Total	370,671	
Fathead Minnow	2000	500	ADL
Inland Silverside	2001	200	ADL
Blue Catfish	2001	74,000	FGL
Channel Catfish	2001	73,794	FGL
	2004	1,621	AFGL
	Total	75,415	
Flathead Catfish	2003	44	ADL
Saugeye	2001	704,701	FRY
	2002	143,101	FRY
	2002	8,410	FGL
	2004	37,425	FGL
	2005	15,806	FGL
	2006	12,134	FGL
	2008	58,500	FGL
	2009	108,815	FGL
	2011	23,919	FGL
	Total	1,112,811	
Florida Largemouth Bass	2002	51,315	FGL
	2014	75,451	FGL
	2016	40,000	FGL
	Total	166,766	
Largemouth Bass	2003	8,775	FGL
	2004	76,290	FGL
	Total	85,065	

Table 5. Objective-based sampling plan components for Kirby Reservoir, Texas 2017–2021.

Gear/Target Species	Survey Objective	Metrics	Sampling Objective
<i>Electrofishing</i>			
Gizzard Shad ^a	Relative Abundance	CPUE-Total	RSE≤25
	Size Structure	Length frequency	N ≥ 50 stock
	Prey Availability	IOV	N ≥ 50
Bluegill ^a	Determine Trends in Relative Abundance	CPUE-Total	RSE≤25
	Size Structure	PSD, Length frequency	N ≥ 50 stock
Common Carp	Relative Abundance	CPUE-Total (≤ 6 inches)	Practical effort
Largemouth Bass	Determine Trends in Relative Abundance	CPUE-Total and Stock-CPUE	Practical effort
	Size Structure	PSD, Length frequency	N ≥ 50 stock
	Body Condition	W_r	5 fish/inch group
<i>Low-frequency electrofishing</i>			
Blue Catfish	Determine Trends in Relative Abundance	CPUE-Total; CPUE-14; and CPUE-20	RSE≤25 (CPUE-Total & Stock); RSE≤30 (CPUE-20)
	Size Structure	PSD, Length frequency	N ≥ 50 stock
	Body Condition	W_r	5 fish/inch group
	Age and growth	Length at age	5 fish per inch group, 12-20 inches
<i>Gill netting</i>			
Blue Catfish	Relative Abundance	CPUE-Total; Stock CPUE; CPUE-14; CPUE-20	Practical effort
	Size structure	PSD, Length frequency	5 fish/inch group; N ≥ 300 fish
	Body Condition	W_r	5 fish/inch group
	Age and growth	Length at age	5 fish/inch group

Table 5. Continued

Gear/Target Species	Survey Objective	Metrics	Sampling Objective
<i>Jug lining</i>			
Blue Catfish	Determine Trends in Relative Abundance Size Structure Age and Growth	CPUE-Total; Stock CPUE; CPUE-20 PSD, Length frequency Growth	Practical effort N ≥ 50 stock Supplement gill net sample
<i>Trap netting</i>			
White Crappie	Determine Trends in Relative Abundance Size Structure Body Condition	CPUE-Total; Stock- CPUE; CPUE-10 PSD, Length frequency W_r	Practical effort N ≥ 50 stock 5 fish/inch group

^a No additional effort was expended to achieve an RSE ≤ 25 for CPUE of Bluegill and Gizzard Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Total acres and percent coverage of vegetation type encountered during the summer 2021 habitat survey, Kirby Reservoir, Texas. Water level at time of survey was about 1.5 feet below conservation pool elevation.

Type	Acres	Percent Coverage (%)
Emergent Vegetation	114	15.4
Flooded Terrestrial Vegetation	94	12.7
Stumps and Flooded Timber	<1	<1.0

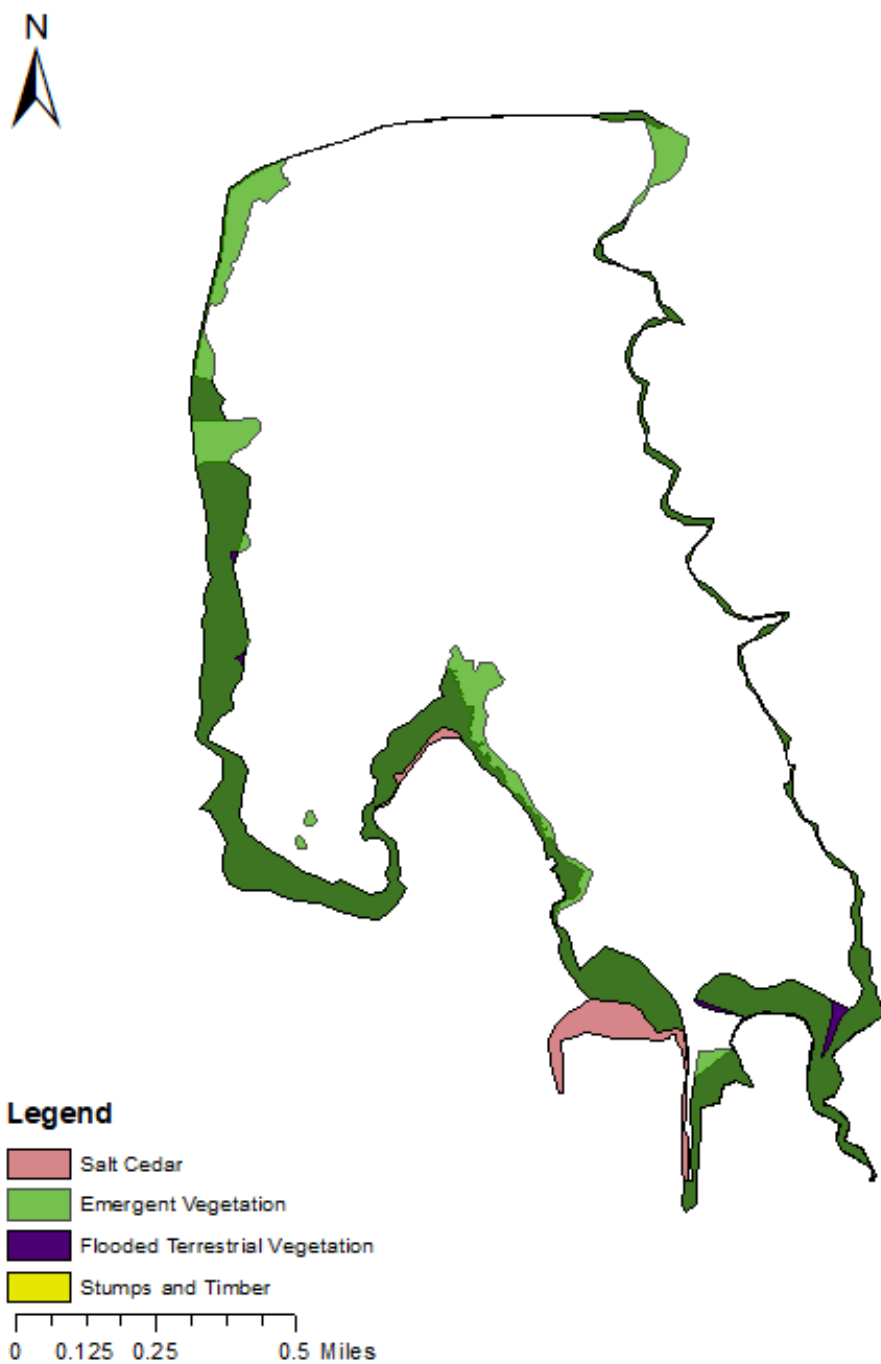


Figure 2. Map of vegetation at Kirby Reservoir, Texas, 2018-2021. Areas where flooded terrestrial vegetation and emergent vegetation were both present appear as a darker green.

Table 7. Total hours of directed fishing effort (relative standard error in parentheses) reported in the March 2019 – February 2020 roving creel survey, Kirby Reservoir, Texas.

Creel statistic	2019/2020
Total fishing effort	50,152.4 (13.0)
Bank Anglers	42,868.0 (12.7)
Boat Anglers	7,284.4 (23.6)

Table 8. Reported hours of directed fishing effort by species (percent of total effort in parentheses) reported in the March 2019 – February 2020 roving creel survey, Kirby Reservoir, Texas.

Species	2019/2020
Anything	9,562.4 (19.1)
Catfishes	38,123.2 (76.0)
Common Carp	56.5 (0.1)
Largemouth Bass	1,255.5 (2.5)
Sunfishes	338.2 (0.7)
White Crappie	816.5 (3.4)

Gizzard Shad

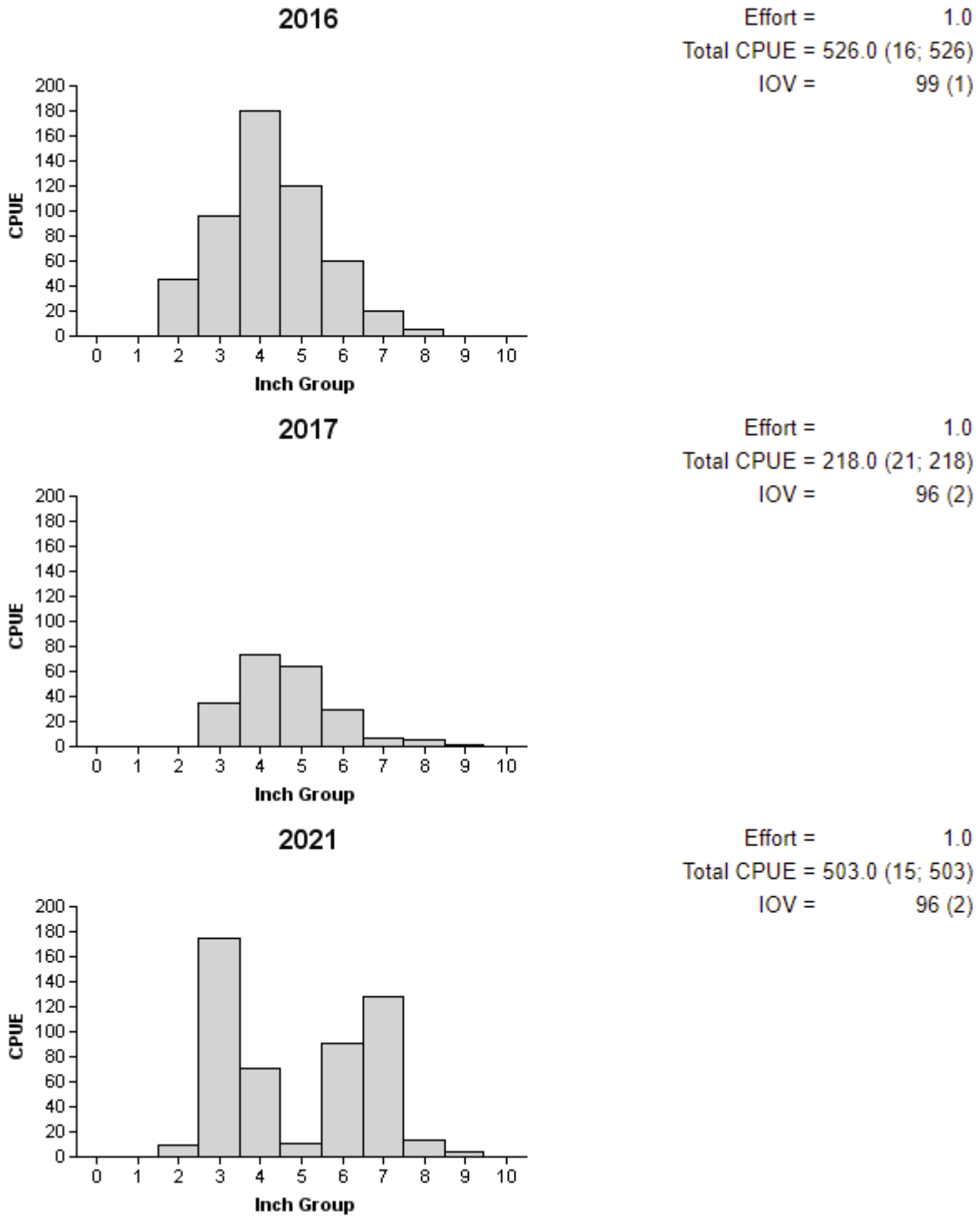


Figure 3. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Kirby Reservoir, Texas, 2016, 2017, and 2021.

Bluegill

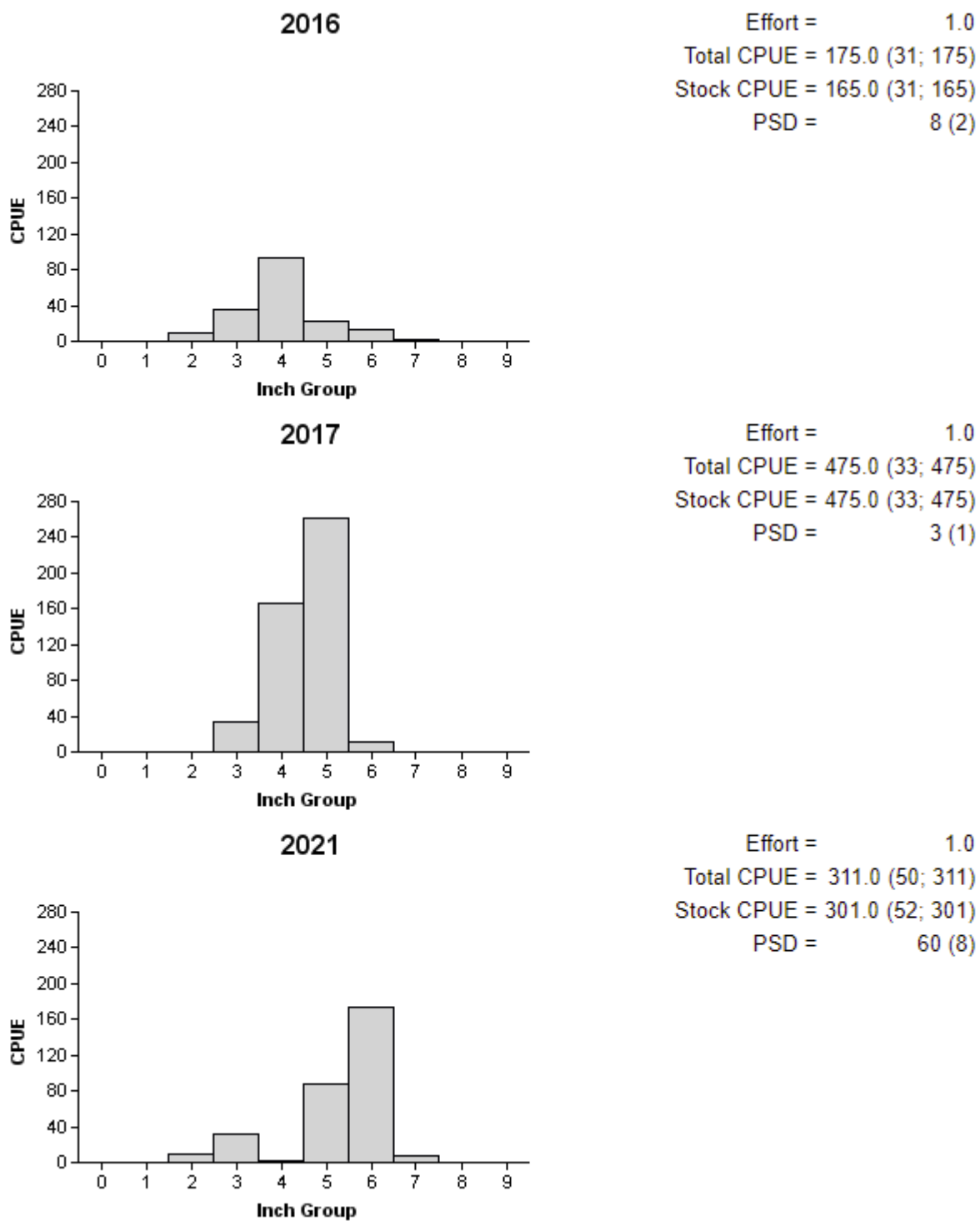


Figure 4. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Kirby Reservoir, Texas, 2016, 2017, and 2021.

Longear Sunfish

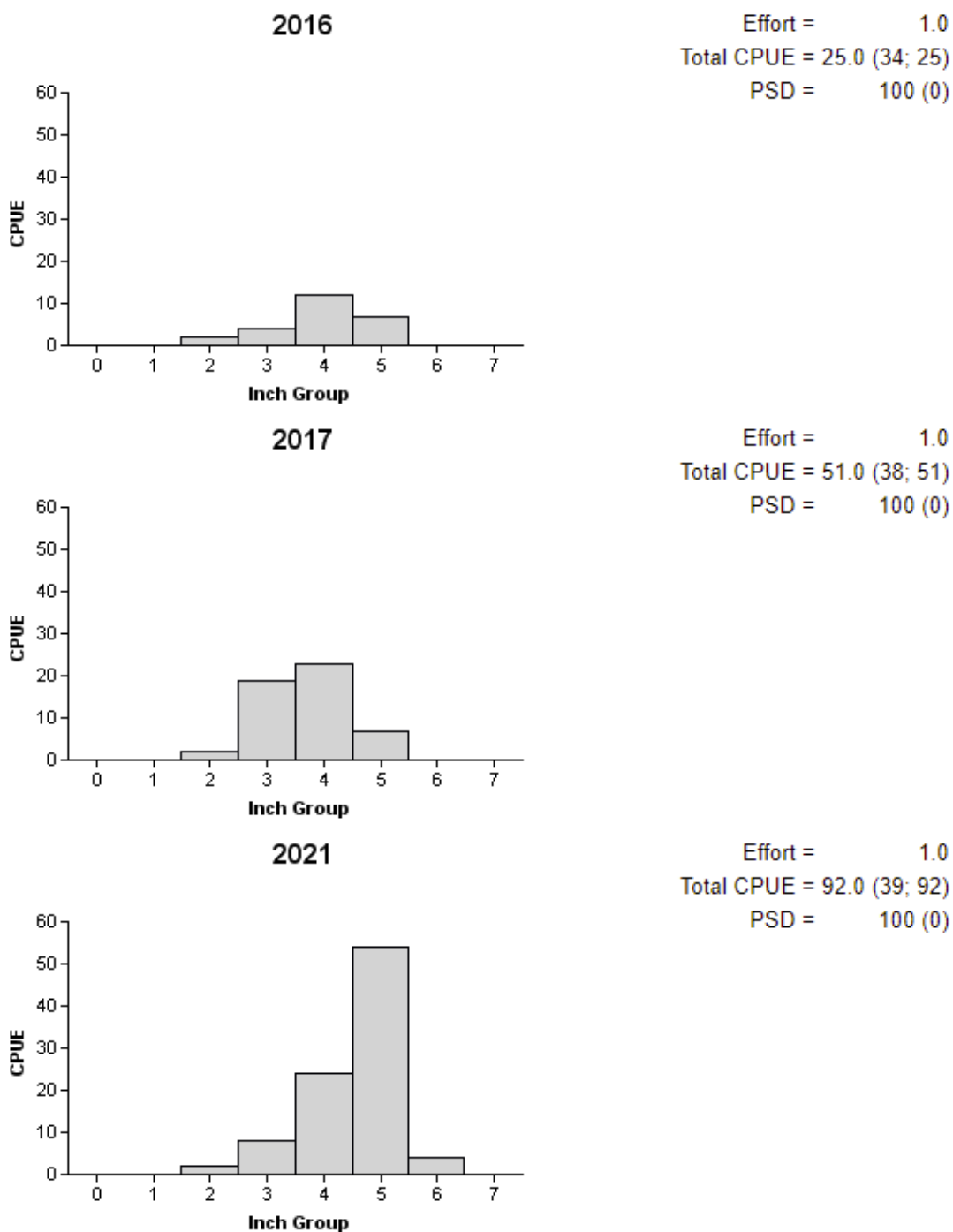


Figure 5. Number of Longear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Kirby Reservoir, Texas, 2016, 2017, and 2021.

Green Sunfish

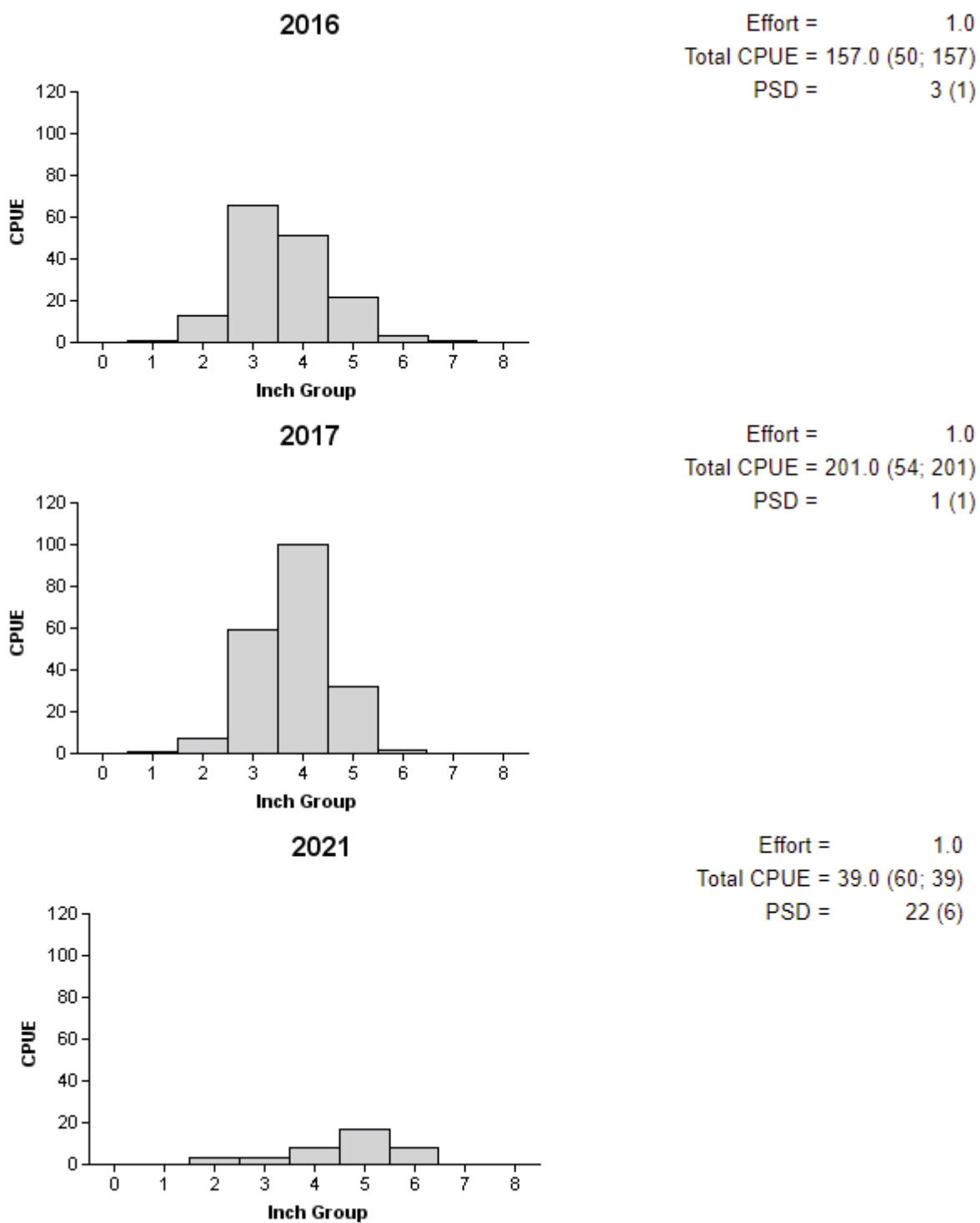


Figure 6. Number of Green Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Kirby Reservoir, Texas, 2016, 2017, and 2021.

Blue Catfish

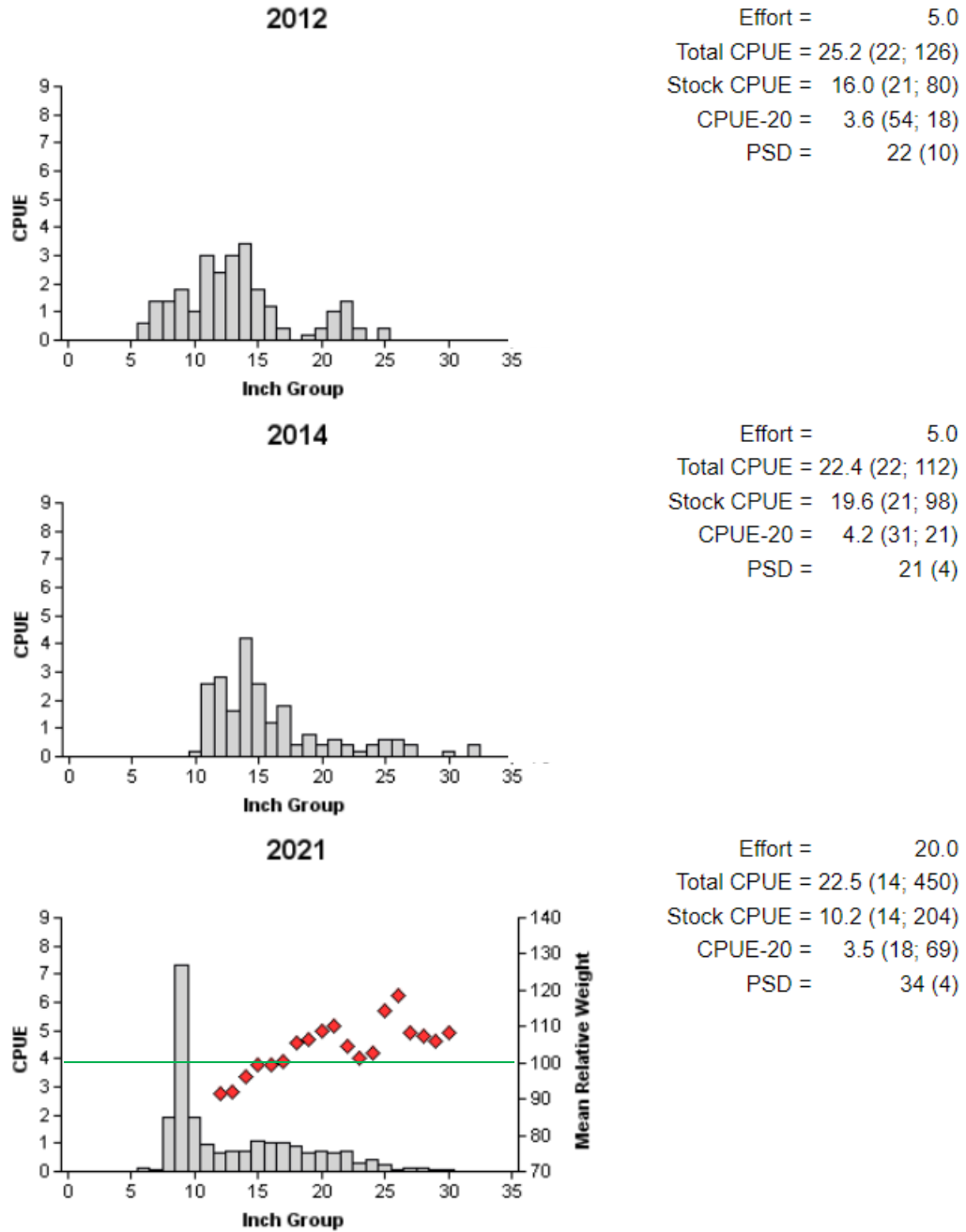


Figure 7. Number of Blue Catfish caught per net night (CPUE, bars), population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weight (diamonds) for gill net surveys, Kirby Reservoir, Texas, 2016, 2017, and 2021. Horizontal line represents the relative weight at 100.

Blue Catfish

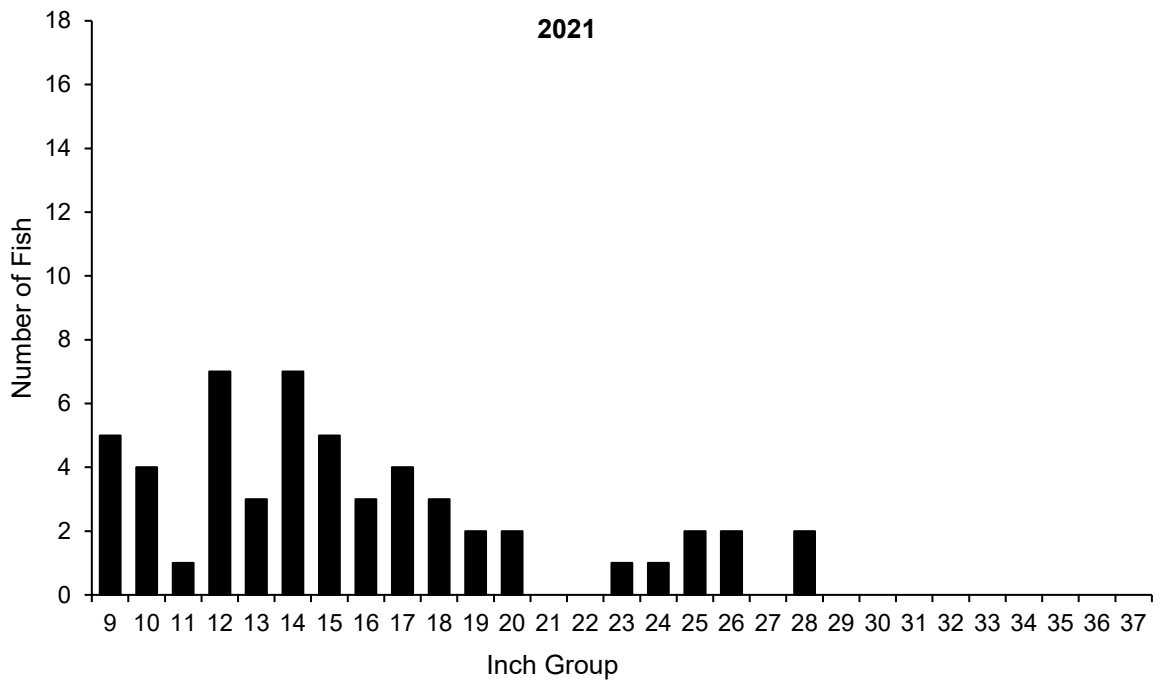
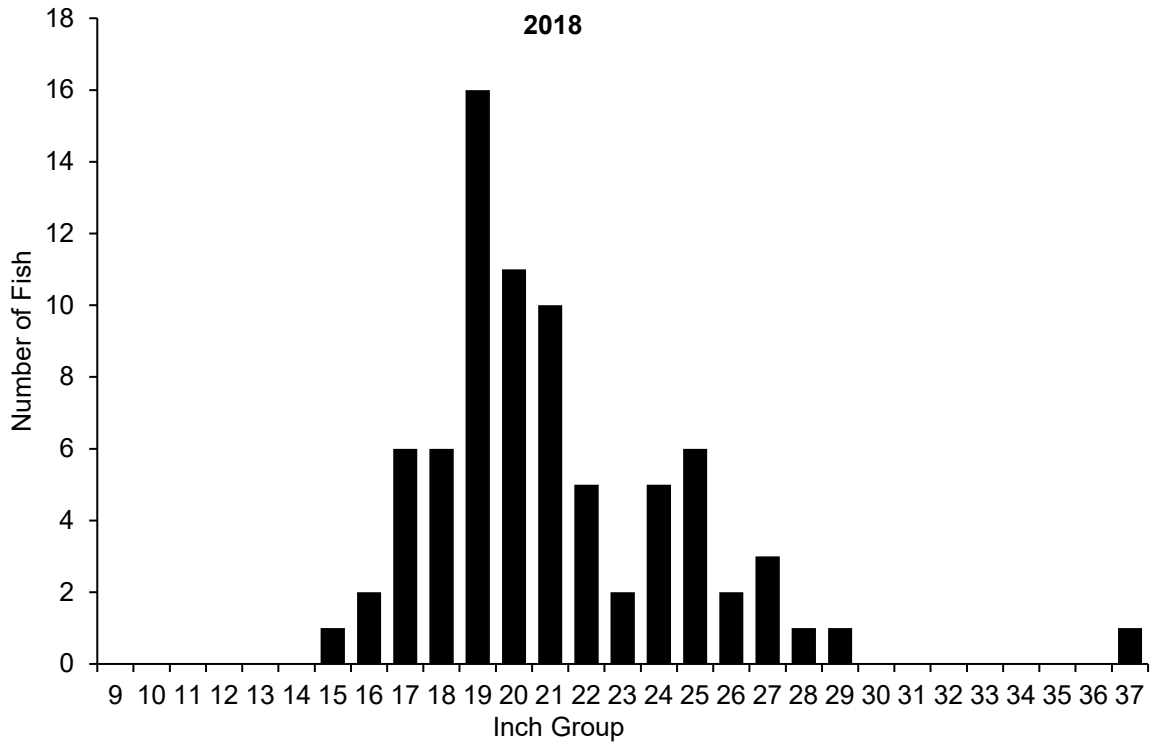


Figure 8. Length frequency distribution for Blue Catfish sampled by jugline pairs during winter – spring 2018 and 2021, Kirby Reservoir, Texas.

Blue Catfish

Table 9. Creel survey statistics for Blue Catfish at Kirby Reservoir, Texas, from March 2019 – February 2020. 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	
	2019/2020	
Surface area (acres)	740	
Directed effort (h)	4,592.4 (22)	
Directed effort/acre	6.2 (22)	
Total catch per hour	0.6 (96)	
Total harvest	2,610.5 (40)	
Harvest/acre	3.5 (40)	
Percent legal released	75.3	

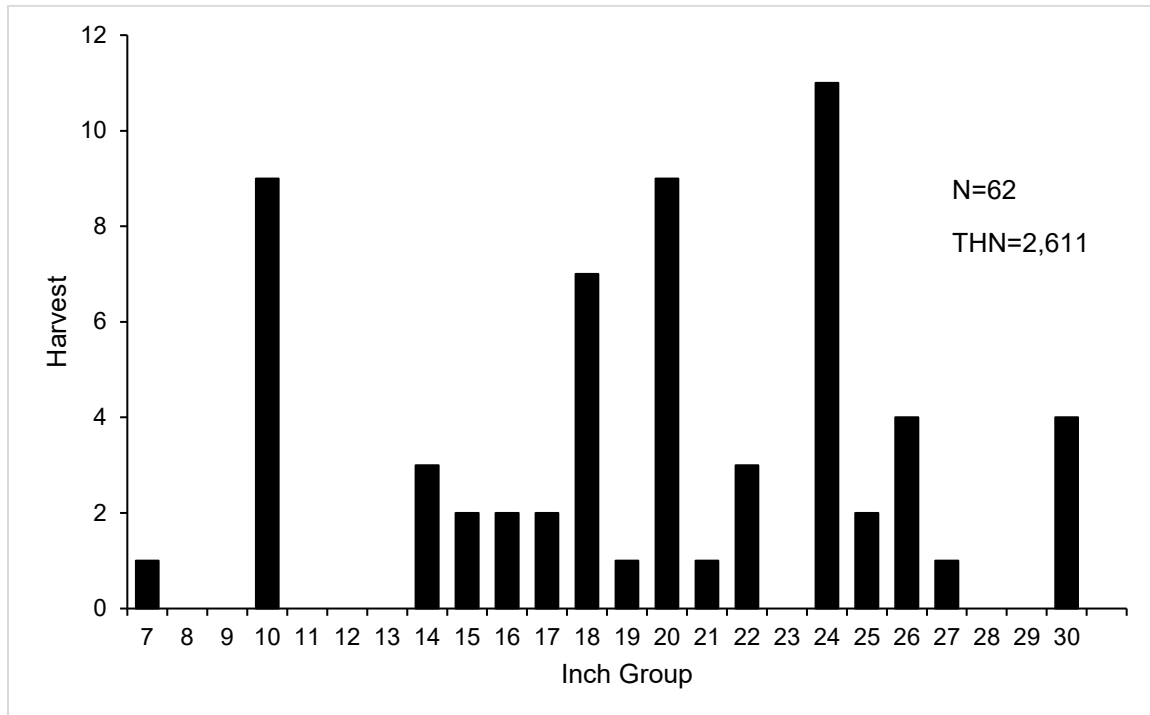


Figure 9. Length frequency of harvested Blue Catfish observed during creel surveys at Kirby Reservoir, Texas, March 2019 – February 2020, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Channel Catfish

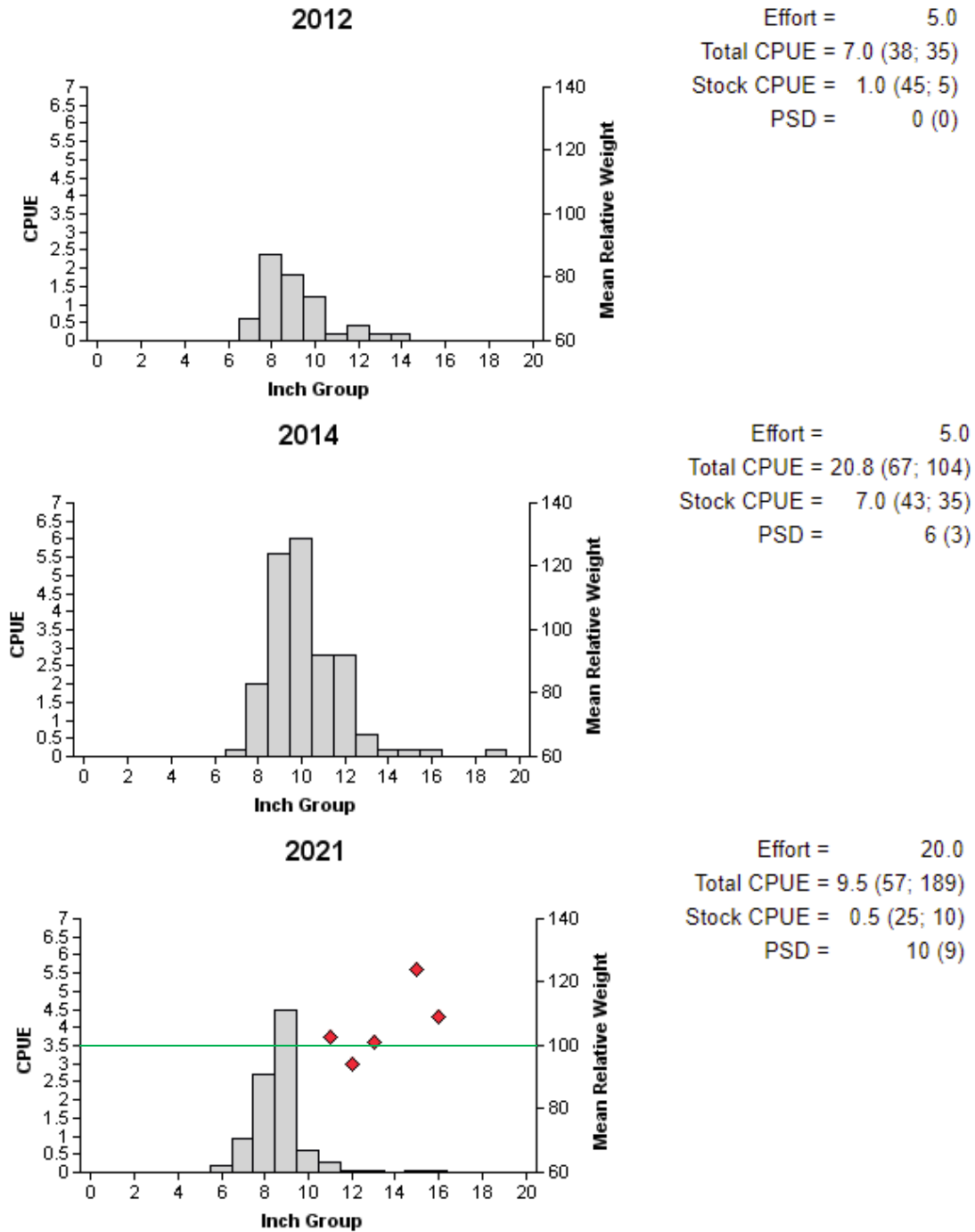


Figure 10. Number of Channel Catfish caught per net night (CPUE, bars), population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weight (diamonds) for gill net surveys, Kirby Reservoir, Texas, 2012, 2014, and 2021. Horizontal line represents the relative weight at 100.

Channel Catfish

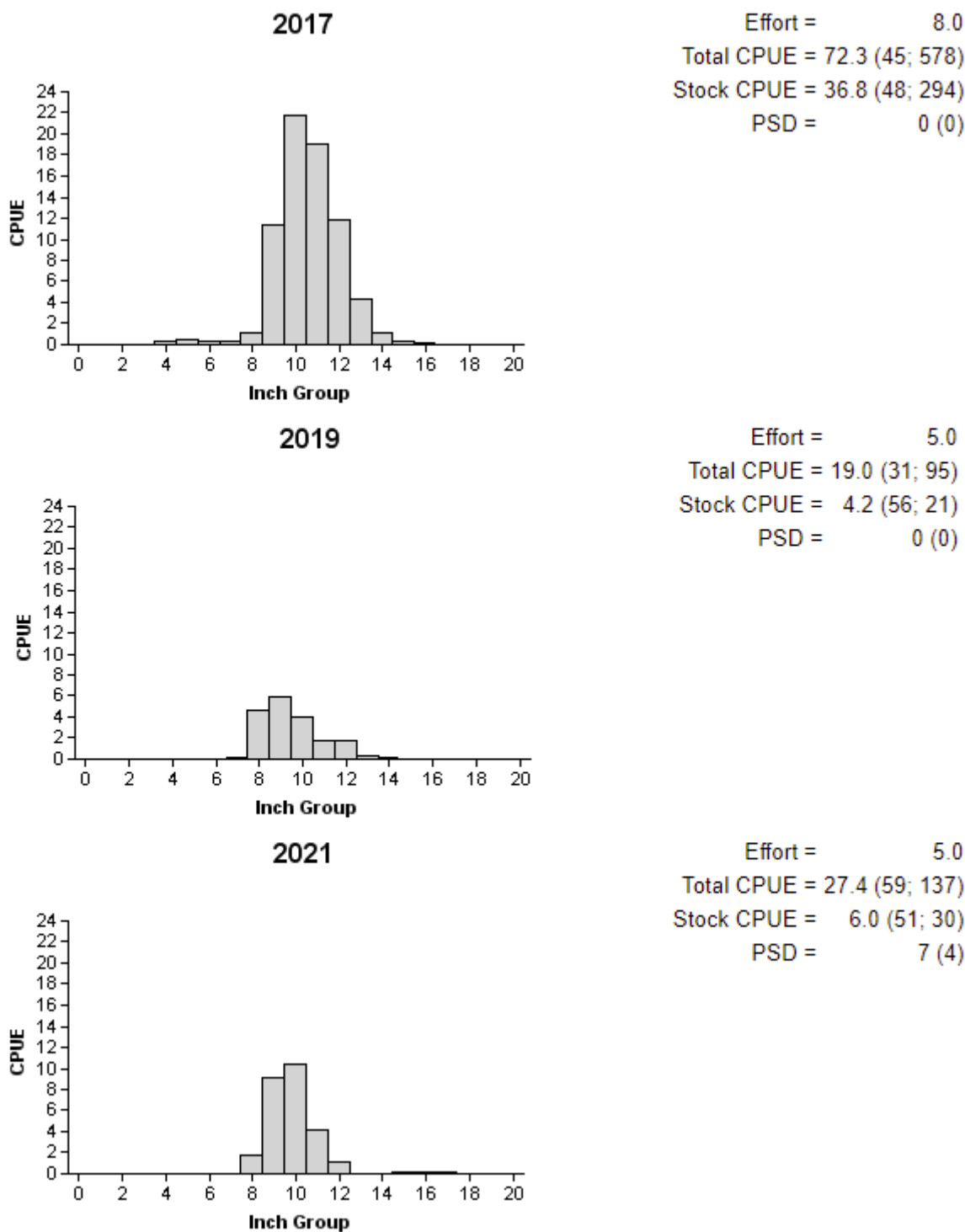


Figure 11. Number of Channel Catfish caught per tandem series (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for tandem hoop netting surveys, Kirby Reservoir, Texas, 2017, 2019, and 2021.

Channel Catfish

Table 10. Creel survey statistics for Channel Catfish at Kirby Reservoir, Texas, from March 2019 – February 2020. 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
	2019/2020
Surface area (acres)	740
Directed effort (h)	1,027.9 (42)
Directed effort/acre	1.4 (42)
Total catch per hour	0.4 (92)
Total harvest	2,462.6 (38)
Harvest/acre	3.3 (38)
Percent legal released	71.2

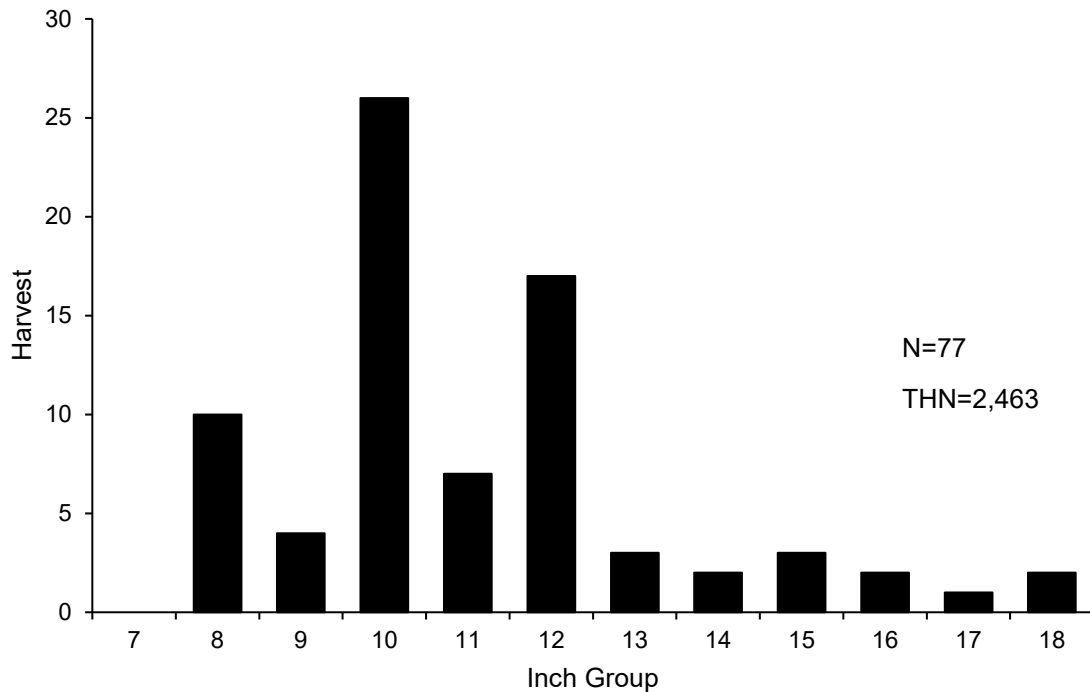


Figure 12. Length frequency of harvested Channel Catfish observed during creel surveys at Kirby Reservoir, Texas, March 2019 – February 2020, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

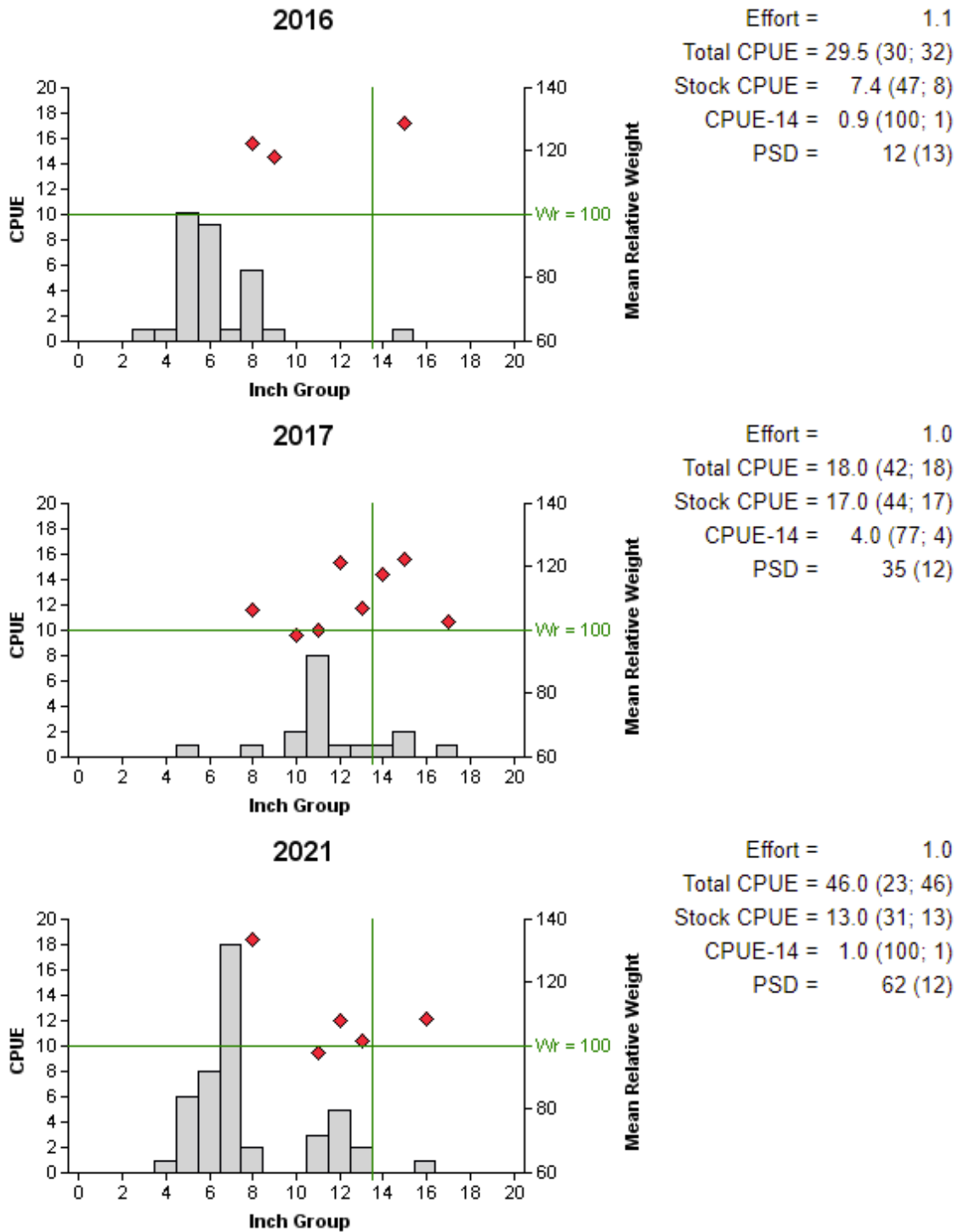


Figure 13. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Kirby Reservoir, Texas, 2016, 2017, and 2021. The vertical line indicates the minimum length limit. Horizontal line represents the relative weight at 100.

Largemouth Bass

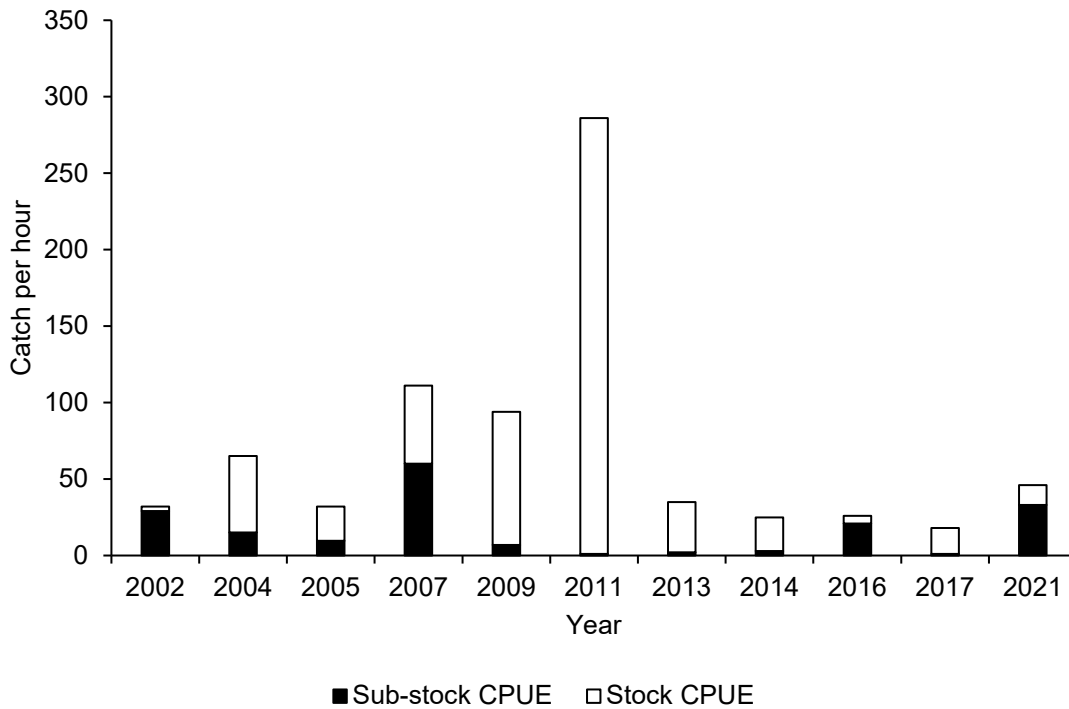


Figure 14. Historical catch rates of sub-stock and stock Largemouth Bass during fall electrofishing surveys, Kirby Reservoir, Texas, 2002-2021.

Table 11. Creel survey statistics for Largemouth Bass at Kirby Reservoir, Texas, from March 2019 – February 2020. 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	
	2019/2020	
Surface area (acres)	740	
Directed effort (h)	1,255.5 (39)	
Directed effort/acre	1.7 (39)	
Total catch per hour	0.1 (138)	
Total harvest	42.1 (295)	
Harvest/acre	0.1 (295)	
Percent legal released	63.9	

White Crappie

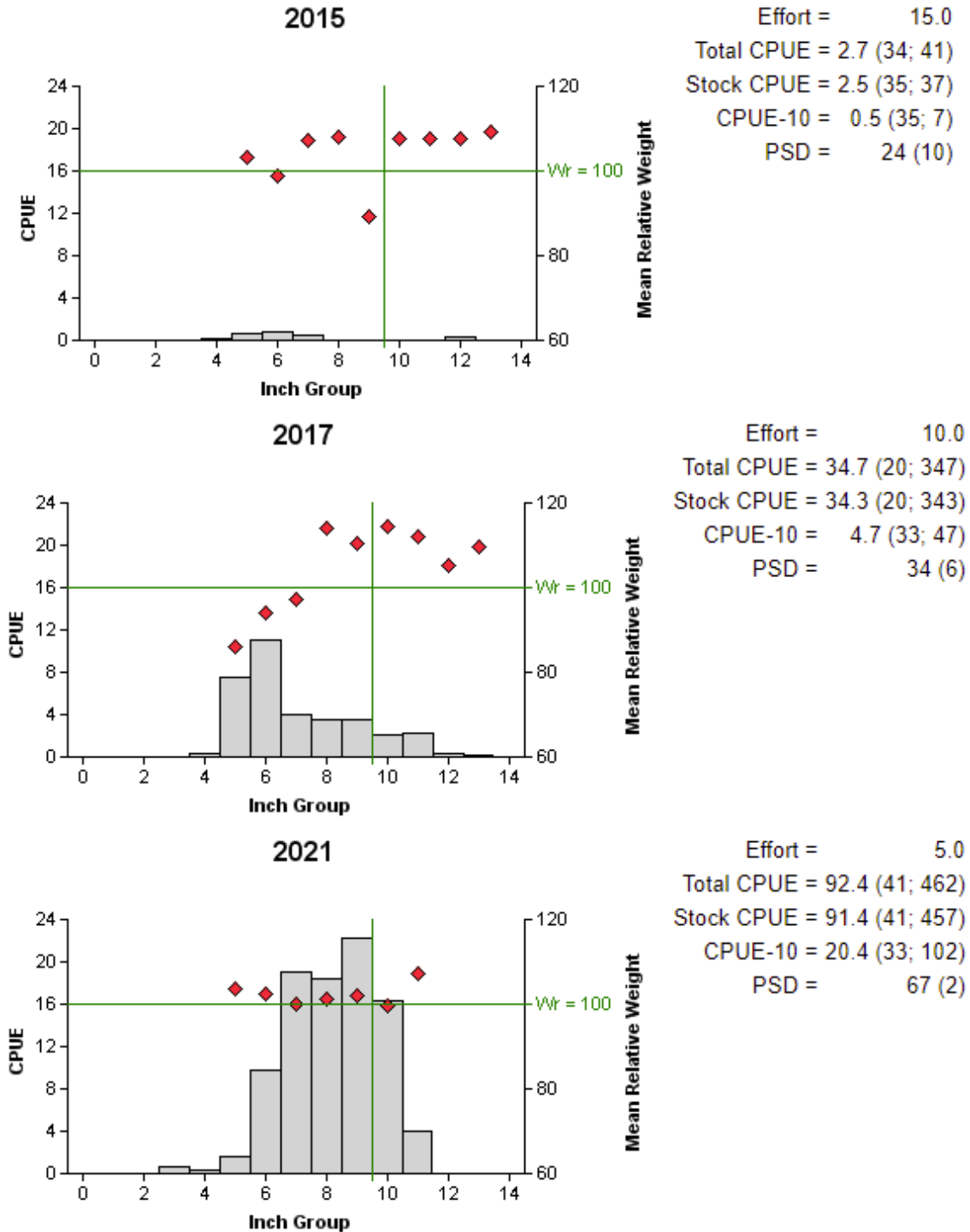


Figure 15. Number of White Crappie caught per net night (CPUE, bars), population indices (RSE and N for CPUE and SE for size structure are in parentheses) and mean relative weight (diamonds) for fall trap netting surveys, Kirby Reservoir, Texas, 2015, 2017, and 2021. Vertical line indicates minimum length limit. Horizontal line represents the relative weight at 100.

White Crappie

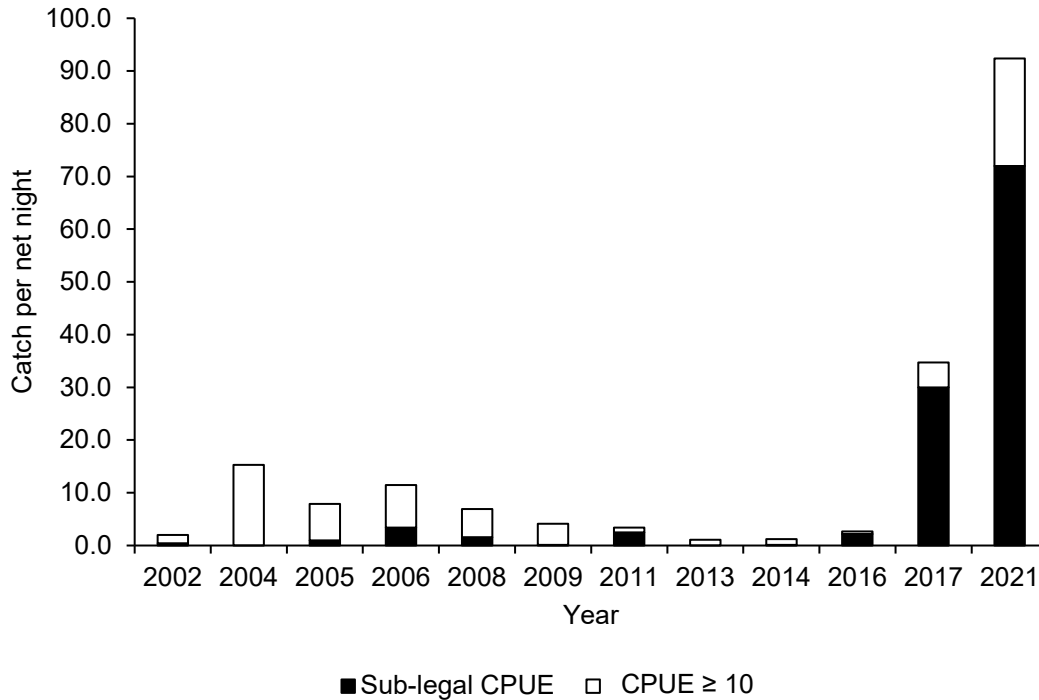


Figure 16. Historical catch rates of sub-legal and legal White Crappie in fall trap netting surveys, Kirby Reservoir, Texas, 2002-2021.

Table 12. Creel survey statistics for White Crappie at Kirby Reservoir, Texas, from March 2019 – February 2020. 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.

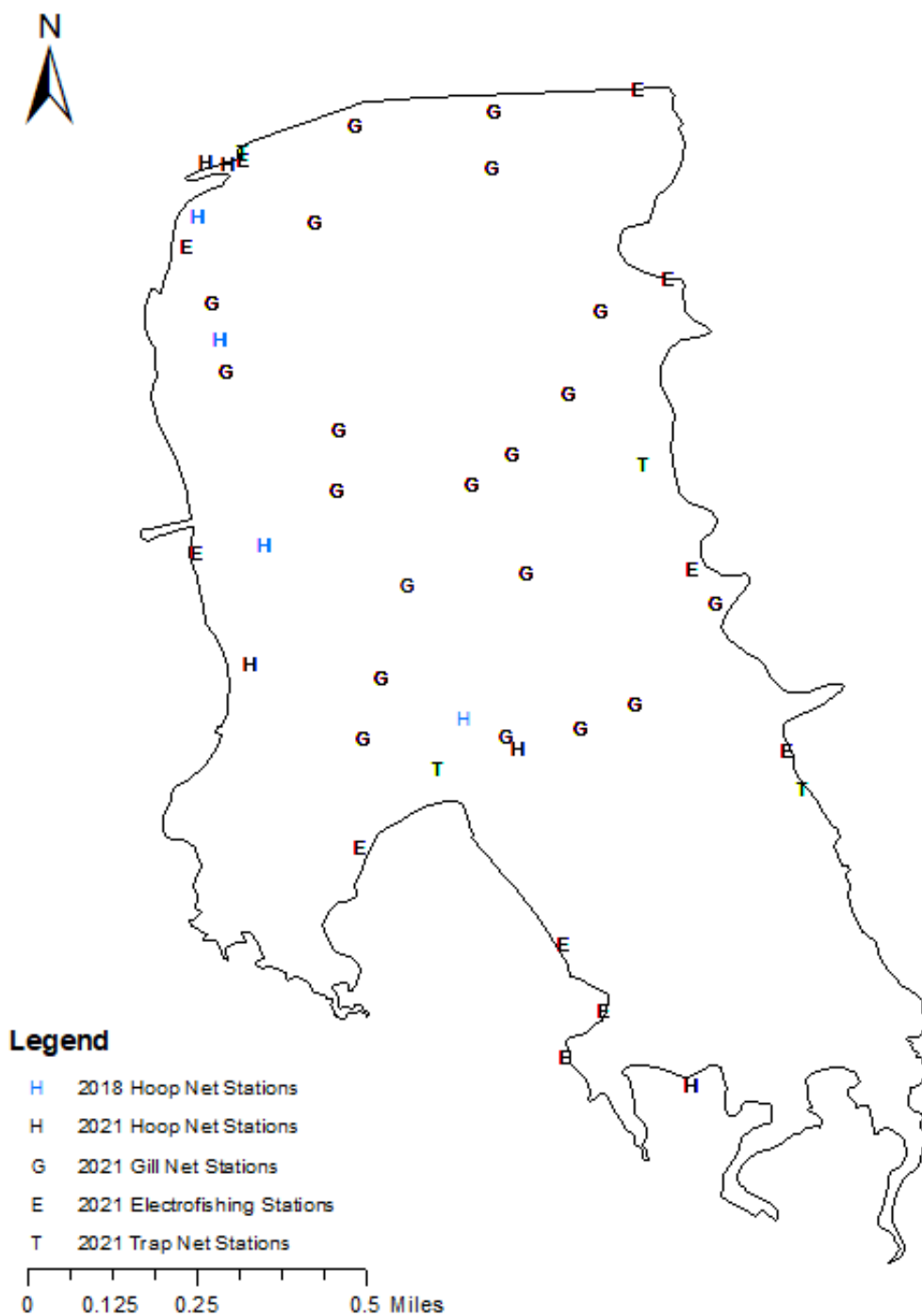
Creel survey statistic	Year	
	2019/2020	
Surface area (acres)	740	
Directed effort (h)	816.5 (49)	
Directed effort/acre	1.1 (49)	
Total catch per hour	0.4 (138)	
Total harvest	210.4 (134)	
Harvest/acre	0.28 (134)	
Percent legal released	56.4	

Proposed Sampling Schedule

Table 13. Proposed sampling schedule for Kirby Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall, and low-frequency electrofishing and baited tandem hoop netting is in the summer. Surveys are denoted by X.

	Survey year			
	2022-2023	2023-2024	2024-2025	2025-2026
Angler Access				X
Vegetation				X
Electrofishing				X
Low-frequency Electrofishing			X	
Trap netting				X
Gill netting				X
Baited tandem hoop netting				X
Report				X

APPENDIX A – Map of sampling locations



Map of all sampling locations by gear type at Kirby Reservoir, Texas, 2018-2021.

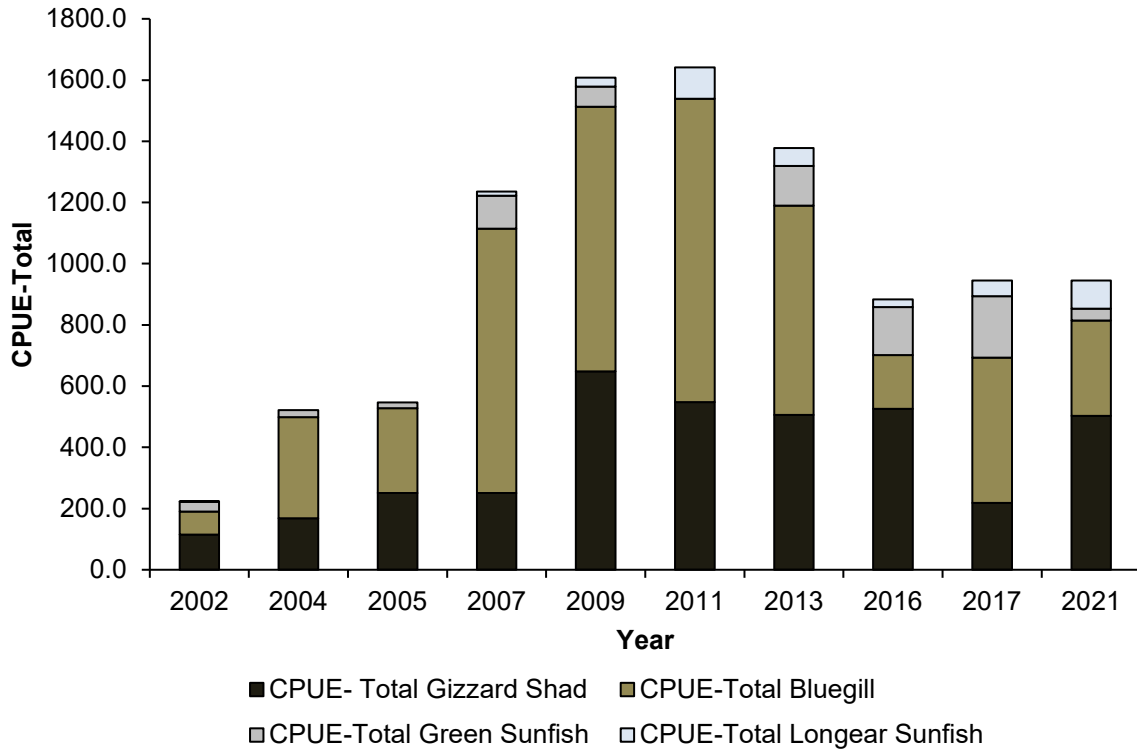
APPENDIX B – Catch rates for all species from all standard gear types

Number (N) and catch per unit effort (CPUE; RSE in parentheses) of all target species collected from all gear types from Kirby Reservoir, Texas, 2021. Sampling effort was 20 gill nets, 8 tandem series for hoop netting, 1 hour for electrofishing, and 5 net nights for trap netting.

Species	Hoop Netting		Gill Netting		Electrofishing		Trap Netting	
	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					503	503.0 (15)		
Common Carp ¹					12	12.0 (30)		
Blue Catfish			450	22.5 (14)				
Channel Catfish	137	27.4 (59)	189	9.45 (57)				
Green Sunfish					39	39.0 (60)		
Orangespotted Sunfish					4	4.0 (77)		
Bluegill					311	311.0 (50)		
Longear Sunfish					92	92.0 (39)		
Largemouth Bass					46	46.0 (23)		
Hybrid Sunfish					5	5.0 (81)		
White Crappie							462	92.4 (41)

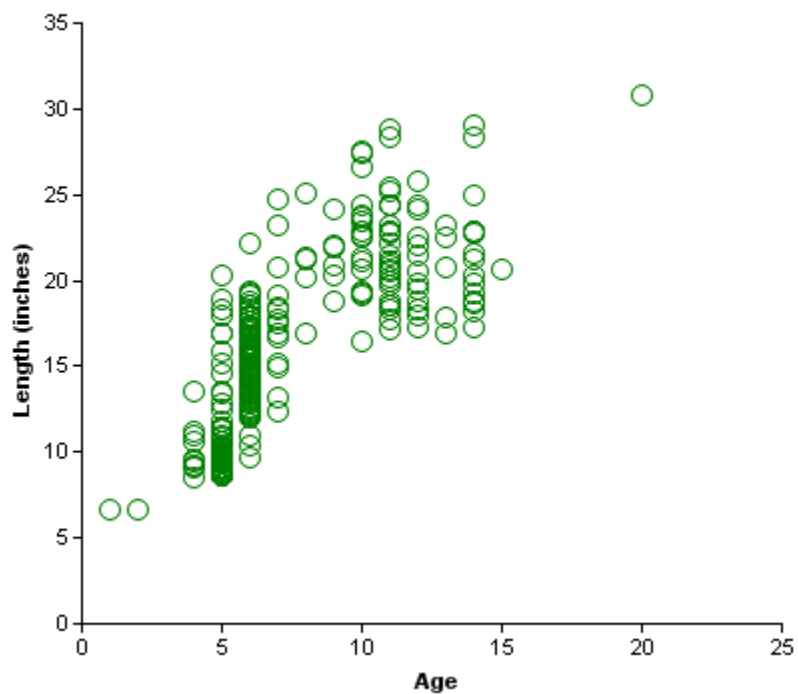
¹≤ 6 inches TL

APPENDIX C – Catch rates of common prey species in fall electrofishing surveys



Catch rates of the most common prey species encountered in fall electrofishing surveys, Kirby Reservoir, Texas, 2002-2021.

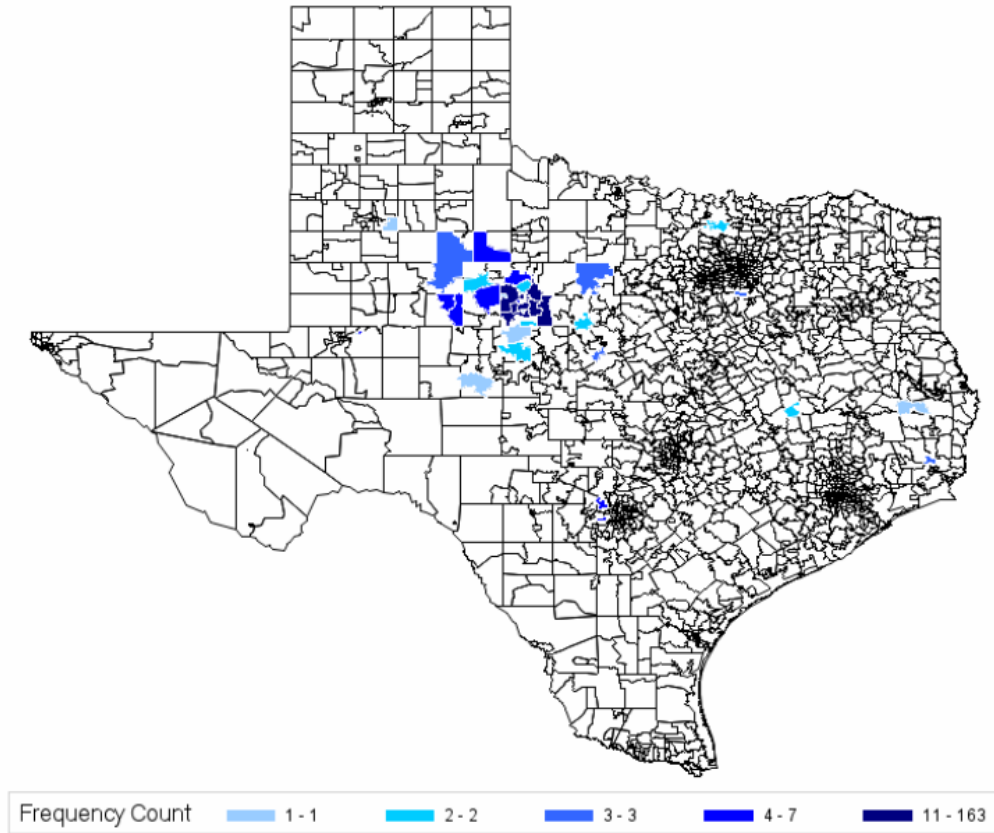
APPENDIX D – Reporting of Age Data for Blue Catfish



Length at age distribution for Blue Catfish collected by gill netting and jug lining at Kirby Reservoir, Texas, 2021.

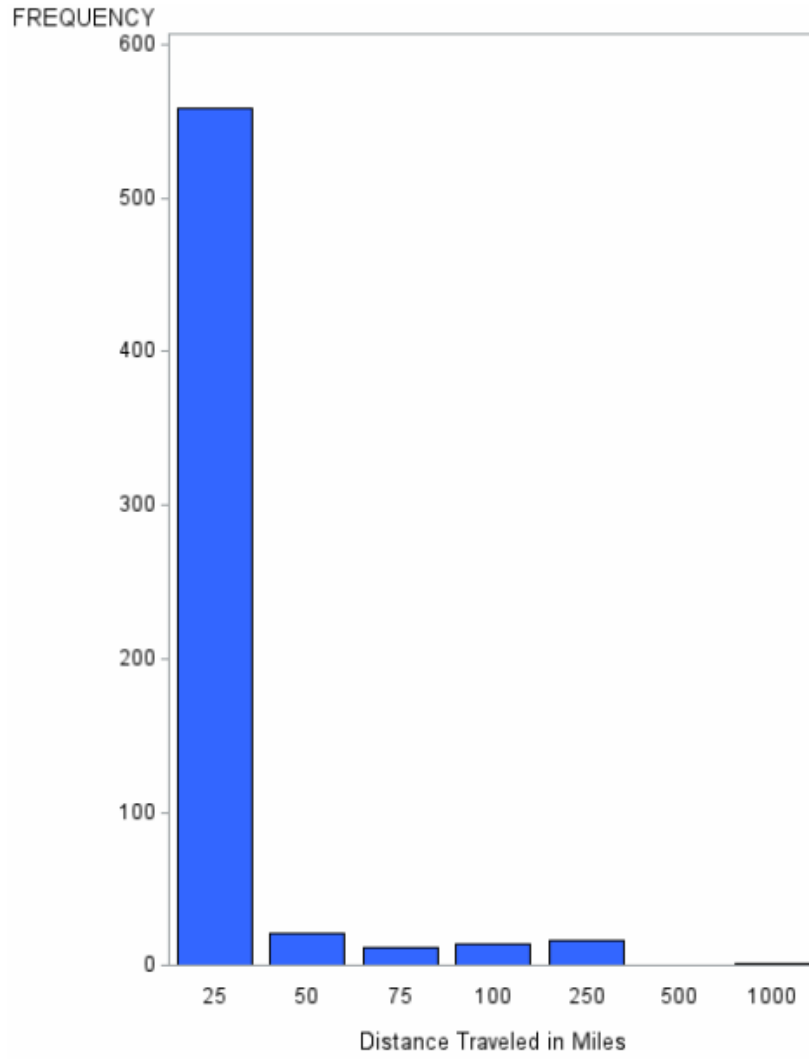
APPENDIX E – Reporting of creel ZIP code data

Anglers by Zip Codes visiting Lake Code 0416 from 31Mar2018 to 31May2020



Location, by ZIP code, and frequency of anglers that were interviewed at Kirby Reservoir, Texas, during the March 2019 through February 2020 creel survey.

APPENDIX E. (continued)



Frequency of anglers that traveled various distances (miles) to Kirby Reservoir, Texas, as determined from the March 2019 through February 2020 creel survey

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