Lake Murvaul

2020 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Contents

Survey and Management Summary

Fish populations in Lake Murvaul were surveyed using electrofishing in 2018 and 2020, trap netting in 2020, and gill netting in 2021. Historical data are presented with the 2018-2021 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: Lake Murvaul is a 3,507-acre impoundment constructed in 1958 on Murvaul Creek in the Sabine River Basin. Structural habitat is mainly inundated timber and natural shoreline features. Native aquatic plant abundance is limited. Invasive plant species have the potential of becoming problematic in Lake Murvaul. During the 2016 vegetation survey, water hyacinth was found on the western side of the FM 1971 bridge and giant salvinia was found in multiple nearshore areas around the lake. No water hyacinth has been seen in recent years, but giant salvinia herbicide treatments are ongoing. A large-scale fish kill occurred in the reservoir during spring 2021. The event impacted numerous species.

Management History: The Largemouth Bass fishery at Lake Murvaul has been a focus of fisheries management efforts for many years. The fishery is currently managed with a 14- to 21-inch protective slot length limit with a 5-fish daily bag, of which only one fish can be greater than 21 inches. Florida Largemouth Bass were stocked in 2011, 2014, 2016, 2018, and 2020 to maintain trophy potential. Other important sport fish include Channel Catfish and crappies, which are managed with statewide harvest regulations.

Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch of Gizzard Shad has increased compared to previous surveys, and most Gizzard Shad were available as prey to most sport fish. Redbreast Sunfish, Bluegill, and Redear Sunfish provide angling opportunities in addition to their role as a prey fish in the reservoir. Bluegill were the most abundant of the sunfish species during 2020 electrofishing, but their abundance has declined compared to previous surveys. Even so, the abundance of prey fish in the reservoir is excellent.
- **Channel Catfish:** The catch of Channel Catfish in gill nets more than doubled in 2021 compared to 2017. The population had many fish available to anglers above the 12-inch minimum length limit up, and fish up to 22 inches were collected.
- **Largemouth Bass:** Largemouth Bass were abundant in the 2020 electrofishing survey. Many fish were present within the protective slot length limit. Also, the number of smaller fish increased compared to previous surveys, which was an indication of a stronger year class in 2020. The growth rate of Largemouth Bass has been stable over the last three surveys and fish body condition has been good.
- **Crappies:** The trap net catch rates for White Crappie and Black Crappie were low. Body condition of White Crappie was good. The growth of Black Crappie was good with fish reaching legal harvest size in 2 years.

Management Strategies: Continue evaluation of the Largemouth Bass slot limit through population and fishery monitoring. Improve fish habitat by implementing additional native aquatic plant establishment projects. Monitor the spread of invasive plants, provide technical guidance to the controlling authority regarding invasive aquatic vegetation management, and consult with TPWD's Aquatic Habitat Enhancement team on vegetation control as necessary. Stock Florida Largemouth Bass every other year to maintain the quality of fishery.

Introduction

This document is a summary of fisheries data collected from Lake Murvaul from 2018-2021. 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 2018-2021 data for comparison.

Reservoir Description

Lake Murvaul is located on Murvaul Creek in the Sabine River Basin. It was constructed by the Panola County Fresh Water Supply District in 1958 for municipal and industrial water supply and public recreation. It has a drainage area of approximately 115 square miles. At conservation pool elevation, the reservoir covers 3,507 acres, shoreline length is 35 miles, and Shoreline Development Index is 6.7 (Table 1). Annual water level fluctuation is generally less than 2 feet; however, drought periods within the last 10 years have reduced the water level to approximately 5 feet below conservation pool elevation (Figure 1). Primary structural shoreline habitat consists of natural shoreline. Almost 20% of shoreline has been modified with bulkhead. Lake Murvaul received national recognition during the 1960s for its trophy Largemouth Bass fishery. The introduction of Florida Largemouth Bass beginning in 1972 has further enhanced the trophy fishery. From 1987 to 1997, anglers caught six Largemouth Bass larger than 13 pounds that were entered into TPWD's ShareLunker Program. The current waterbody record for Largemouth Bass caught in 1993 is 14.87 lbs. A large-scale fish kill occurred in the reservoir during spring 2021. The event impacted numerous species.

Angler Access

Lake Murvaul has four public boat ramps but shoreline access for anglers is limited. Additional boat ramp characteristics are in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Lechelt and Bister 2017) included:

1. Invasive aquatic plant management.

   Action: Annual surveys have been conducted to monitor coverage of invasive species. TPWD's Aquatic Habitat Enhancement Team has conducted herbicide treatment of giant salvinia as well as released giant salvinia weevils.

2. Continue to manage the trophy Largemouth Bass fishery.

   Action: Florida Largemouth Bass were stocked in 2018 and 2020. Additional electrofishing was conducted during 2018 to monitor the Largemouth Bass and prey fish populations. The reservoir-specific Big Bass Survey was discontinued when new changes to Toyota ShareLunker Program were implemented to allow the reporting of fish ≥ 8 lbs.

3. Improve fisheries habitat.

   Action: Artificial fish habitat structures were deployed in 2017 and 2019. Native aquatic plants were planted in protective herbivory-exclusion cages during 2019.

Harvest regulation history: Sport fishes in Lake Murvaul are currently managed with statewide regulations except for Largemouth Bass. Largemouth Bass have been managed since 1999 with a 14- to 21-inch slot length limit and 5-fish daily bag of which only one fish can be over 21 inches. The previous regulation was a 14-inch minimum length limit. Current regulations are found in Table 3.

Stocking history: Florida Largemouth Bass were initially stocked in Lake Murvaul in 1972, one of the first reservoirs in the State of Texas to receive such stockings. Florida Largemouth Bass were most recently stocked in 2017-2020. The complete stocking history is presented in Table 4.

Vegetation/habitat management history: Aquatic vegetation coverage has decreased substantially in Lake Murvaul during recent surveys. Historically, the reservoir had moderate densities of aquatic vegetation, with the maximum occurring in 1997 when hydrilla covered approximately 27% of the reservoir surface area (Ryan and Brice 1998). However, hydrilla coverage has been decreasing in recent years following drought conditions in 2006 and 2011 and less than an acre was found during the 2016 vegetation survey (Lechelt and Bister 2017). Only trace amounts of hydrilla have been observed in recent years. Water hyacinth was initially discovered in 2000 (Ryan and Brice 2001) and was physically removed. Water hyacinth was discovered again in Lake Murvaul in 2014 and has been treated with herbicide. No water hyacinth has been observed in recent surveys. Giant salvinia has been introduced on multiple occasion since 2009 and is currently found in the reservoir (Bister and Brice 2009). Efforts to control the spread of giant salvinia have included physical removal, preventing spread using booms, and treatment with herbicide. Management efforts have effectively reduced the amount of giant salvinia in the reservoir. Artificial fish habitat structures were deployed in 2017 and 2019 at several locations to improve fish habitat with funding from the Texas Conservation License Plate Program. The locations of these structures can be found at: https://tpwd.texas.gov/fishboat/fish/recreational/lakes/murvaul/structure.phtml. Native aquatic plants were planted in protective cages in 2019 to re-establish native plants eliminated during previous giant salvinia herbicide treatments. These habitat improvement projects have been conducted in cooperation with the Panola County Fresh Water District.

Water transfer: Lake Murvaul was built for municipal and industrial water supply and public recreation and no interbasin water transfers are known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Murvaul (Lechelt and Bister 2017). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1 hour at 12, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from 13 randomly selected fish (range 13.0 to 14.9 inches).

Trap netting – Crappie were collected using trap nets (10 net nights at 10 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Ages for Black Crappie were determined using otoliths from 13 randomly selected fish (range 9.0 to 10.9 inches).

Gill netting – Channel Catfish were collected by gill netting (5 net nights at 5 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

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.

Habitat – A structural habitat survey was last conducted in 2012 (Bister and Wright 2013). Aquatic invasive vegetation surveys were conducted in 2017-2020 to monitor alligator weed, giant salvinia, hydrilla, and water hyacinth. Native aquatic vegetation groups were surveyed and summarized in 2020. Habitat was assessed with 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 2021).

Results and Discussion

Habitat: Bister and Wright (2013) reported littoral zone structural habitat consisted primarily of natural shoreline and standing timber (Table 6). In 2020, native vegetation covered roughly 2% of the reservoir's surface area and less than 1% was covered by non-native vegetation, which was similar to the 2019 survey (Table 7). Native emergent species covered 69 acres (2% of the reservoir) and were the most dominant native aquatic vegetation type during 2020. Giant salvinia coverage has decreased from 89 acres (2.5% of the reservoir) in 2017 to trace amounts in most areas of the lake. Alligatorweed was also present in trace amounts. Hydrilla and water hyacinth were not detected in 2020.

Prey species: The 2020 electrofishing catch rate of Gizzard Shad (343.0/h) was higher than previous surveys (Figure 2). The index of vulnerability (IOV) indicated that 89% of Gizzard Shad were available to existing predators (Figure 2). Threadfin Shad were present in the 2020 electrofishing survey. Redbreast Sunfish, Bluegill, and Redear Sunfish (Figures 3-5) provide angling opportunities in addition to their role as a prey fish in the reservoir. While Bluegill was the most abundant sunfish species during 2020 electrofishing, their relative abundance has declined from 956.0/h in 2016 to 448.0/h in 2020 (Figure 4).

Channel Catfish: The gill net catch rate of Channel Catfish was 33.6/nn in 2021, which was higher than the 2017 survey (14.0/nn) and 2013 survey (19.0/nn; Figure 6). The CPUE of fish greater than 12 inches also increased from 16.2/nn in 2013 to 24.4/nn in 2021. Body condition was adequate (relative weight ≥ 90 for most inch classes) and similar to previous surveys. A tandem hoop netting survey was planned for

spring 2021 but was cancelled due to an ongoing fish die-off event during the time sampling was scheduled.

Largemouth Bass: The electrofishing catch rate of Largemouth Bass in 2020 (Total CPUE) was 161.0/h, which was higher than 2018 (99.0/h) but similar to 2016 (163.0/h; Figure 7). The catch rate of fish ≥ 8 inches (Stock CPUE) was higher in 2020 (122.0/h) than previous surveys. The CPUE of fish above 14 inches in 2020 (34.0/h) was similar to 2018 (38.0/h) but less than 2016 (51.0/h). The number of fish within the protective slot length limit has been relatively stable since 2018. The 2020 electrofishing survey captured a large quantity of smaller Largemouth Bass, which was an indication of good reproduction and recruitment. Body condition in 2020 was good (W_r ≥ 95) for nearly all size classes of fish. Growth rate has been stable and remains well within an acceptable range; in 2020 average age at 14 inches (13.0 to 14.9 inches) was 2.1 years (N = 13; range = 1 – 4 years), in 2018 average age at 14 inches was 1.9 years (N =13; range = 1 – 3 years), and in 2016 average age at 14 inches was 2.1 years (N = 15; range = 1 – 4 years; Lechelt and Bister 2017). The current slot length limit is functioning as intended. Recent evidence of increased reproduction and recruitment, combined with ongoing habitat improvement efforts, should result in a higher quality Largemouth Bass population in the coming years.

Crappie: The trap net catch rate of White Crappie improved in 2020 (2.4/nn) compared to 2016 (0.6/nn). However, CPUE in 2020 was still much lower than 10.4/nn in 2012 (Figure 8). Black Crappie CPUE in 2020 (2.3/nn) was low compared to 2016 (4.8/nn) (Figure 9). It took twice the effort (10 net nights) to catch a similar number of fish. Body condition was good for White Crappie with W_r values above 90 for all inch groups (Figure 8). Black Crappie condition was lower, but most inch classes had an average W_r above 80 (Figure 9). However, growth of Black Crappie was good. Average age at 10 inches was 2.0 years (N = 13; all fish were age 2). An insufficient number of White Crappie were collected to calculate average age at 10 inches during the 2020 survey.

Fisheries Management Plan for Lake Murvaul, Texas

Prepared – July 2021

ISSUE 1: Giant salvinia is the most problematic invasive species at Lake Murvaul. Herbicide treatments along with cold winter temperatures have reduced the amount of giant salvinia present in the reservoir. However, continued monitoring and treatment will be necessary to manage this invasive species. Water hyacinth has been previously introduced and treated with herbicide. Even though it has not been seen in recent years, monitoring for water hyacinth is necessary in case it regrows or is reintroduced.

MANAGEMENT STRATEGY

1. Provide technical guidance to the controlling authority regarding giant salvinia management.
2. Conduct annual surveys to monitor trends and estimate coverage of giant salvinia and other invasive plants.
3. Coordinate with TPWD's Aquatic Habitat Enhancement (AHE) team to treat nuisance aquatic vegetation with herbicide when necessary.

ISSUE 2: Lake Murvaul has a high-quality Largemouth Bass fishery as a result of the 14- to 21-inch slot-length limit. Continued monitoring of the Largemouth Bass population and fishery are necessary to detect any large-scale changes under the current regulation. Stocking of Florida Largemouth Bass is necessary to maintain or enhance the high-quality fishery.

MANAGEMENT STRATEGIES

1. Conduct an angler creel survey every eight years, next survey will be conducted in 2024-2025, to monitor angling effort and catch rates for Largemouth Bass.
2. Conduct electrofishing surveys in fall every two years to monitor relative abundance, growth, and size structure of Largemouth Bass and prey species. The next survey will be in 2022.
3. Request stocking of Florida Largemouth Bass (1,000 fish/km of shoreline) every other year, to maintain the trophy aspect of the fishery. The next stocking request will be in 2022.
4. Promote the Toyota ShareLunker Program by maintaining signs at public boat ramps.
5. Monitor Largemouth Bass tournament results to make note of big fish caught at the reservoir.

ISSUE 3: The abundance of native aquatic vegetation was reduced due to collateral impact from herbicides during initial management efforts to eliminate giant salvinia. Some native aquatic plants have been planted in protective herbivory-exclusion cages in 2019 to improve habitat in the reservoir, but additional plantings would be beneficial.

MANAGEMENT STRATEGIES

1. Work with Panola County Fresh Water District to develop a plan to establish additional planting sites in the reservoir.
2. Recommend the construction and maintenance of an on-site native aquatic plant nursery on water district property to use as a source of plants for ongoing habitat improvement.
3. Work with TPWD AHE and the Habitat and Angler Access Program to fund the project.

ISSUE 4: A fish kill occurred on Lake Murvaul during spring 2021 that affected numerous fish species. Additional sampling should be conducted to determine any large-scale impacts to the fish community.

MANAGEMENT STRATEGIES

1. Conduct additional trap netting in fall 2022 to monitor Black Crappie and White Crappie.
2. Conduct additional gill netting and tandem hoop netting during spring 2023 to monitor the Channel Catfish population.
3. Work closely with TPWD Kills and Spills Team (KAST) if any repeated events occur.

ISSUE 5: 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 through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule (2021-2025)

Sport fish, forage fish, and other important fishes

Sport fishes in Lake Murvaul include Largemouth Bass, Channel Catfish, White Crappie, and Black Crappie. Known important forage fishes include Gizzard Shad, Threadfin Shad, and Bluegill. The proposed sampling schedule can be found in Table 8.

Low-density fisheries

No low-density fisheries exist in Lake Murvaul.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are a popular sport fish in Lake Murvaul. The most recent spring-quarter creel survey indicated Largemouth Bass angling comprised 31% of total angling effort (Lechelt and Bister 2017). Largemouth Bass have been managed with a 14-21-inch slot regulation since 1999. Trend data on CPUE, size structure, and body condition have been collected biennially since 2004 with fall nighttime electrofishing. Continuation of biennial trend data in this reservoir with night electrofishing in the fall will allow for determination of any large-scale changes in the Largemouth Bass population under the slot-limit regulation that may spur further investigation. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in fall 2022 and 2024, but sampling will continue at random sites until 50 stock-size fish are collected and the RSE of CPUE-S is $\leq$ 25. Past sampling efforts have shown 12-random stations are usually sufficient to reach this level of precision; however, an additional 3 random

stations will be determined in the event extra sampling is required. A maximum of 15 stations will be sampled. Sampling objectives for Largemouth Bass will include size structure (PSD and length frequency), growth (mean age at 14 inches using a sample size of 13 fish between 13.0 and 14.9 inches), relative abundance (CPUE-total and CPUE-stock), and condition (mean W_r using lengths and weights from 10 fish per inch group).

Crappies: Crappies continue to be the most sought-after species during the spring at Lake Murvaul with 45% of anglers specifically targeting crappies during a spring angler creel survey in 2017 (Lechelt and Bister 2017). However, the catch of White Crappie and Black Crappie in fall trap netting surveys have been variable. Only one survey (2012) of the previous three has been sufficient in capturing enough White Crappie to meet our sampling goal of ≥ 50 stock-size fish and RSE of CPUE-S ≤ 25; the Black Crappie sampling goal has not been met in the previous three surveys. Therefore, our sampling objectives will now be based on the combined catch of both crappie species (White Crappies and Black Crappies). A minimum of five single-cod trap nets set for one night at random locations will be used to collect crappies during fall 2024. If additional sampling is required to meet our objective, an additional five nets will be set for one night at random locations. A maximum of 10 net nights will be sampled. Our sampling goal is to collect ≥ 50 stock-size fish and achieve an RSE of CPUE-S ≤ 25. Data collected will include size structure (PSD and length frequency), growth (mean age at 10 inches using a sample size of 13 fish between 9.0 and 10.9 inches), relative abundance (CPUE-total and CPUE-stock), and condition (mean W_r using lengths and weights from 10 fish per inch group). An additional trap netting survey will be conducted during fall 2022 to assess the Crappie community following the spring 2021 fish kill.

Channel Catfish: Trend data on relative abundance and size structure of Channel Catfish have been collected every four years using spring gill netting surveys in Lake Murvaul. In the spring of 2017, both gill nets and tandem hoop nets were used to sample Channel Catfish to compare the effectiveness of each gear and determine which gear should be used for future sampling. The sampling objective for each gear type was 50 stock-size fish for PSD and a RSE for CPUE-S ≤ 25. Five gill nets were set in random locations and a total of 61 stock-size fish were collected with a CPUE-S RSE of 3 (Lechelt and Bister 2017). This achieved the goal of RSE for CPUE-S ≤ 25, but we were unable to capture the targeted 100 stock-size fish. In comparison, ten tandem hoop nets were set in random locations, which yielded 164 stock-size fish, but a CPUE-S RSE of 40 (Lechelt and Bister 2017). The goal of RSE for CPUE-S ≤ 25 was not met for the tandem hoop nets, but it was sufficient at capturing enough stock-size fish. Given that both gears achieved only one of the sampling objectives, Channel Catfish sampling was planned for both gears in 2021. However, due to an ongoing fish kill, only gill netting was conducted in 2020. To further investigate the utility of baited tandem hoop netting to assess Channel Catfish, both gill netting and hoop netting will be conducted during spring 2023 and 2025. This will allow us to continue to evaluate the effectiveness of each gear.

Channel Catfish will be sampled using baited tandem hoop nets and gill nets in the spring of 2023 and 2025. The estimated number of hoop net sets to achieve an RSE for CPUE-S ≤ 25 is 10 sets using the recommended 2-night soak duration. A target of 50 stock-size fish should provide an adequate PSD estimate per the tandem hoop net procedures (PSD within 10% with 80% confidence, 75-140 fish are recommended; Miranda 2007). Ten additional random stations will be selected in the event extra sampling is necessary. A maximum of 20 tandem hoop net sets will be sampled. The estimated number of gill nets to collect 100 stock length fish and achieve an RSE for CPUE-S ≤ 25 is five that will be soaked overnight. Five additional gill nets will be set if necessary. A maximum of 10 gill nets will be set. Sampling objectives for Channel Catfish for both gears will include size structure (PSD and length frequency), relative abundance (CPUE-total and CPUE-stock), and condition (mean W_r using lengths and weights from 10 fish per inch group). The additional sampling during spring 2023 is planned to assess the Channel Catfish population following the 2021 fish kill.

Prey Species: Gizzard Shad, Threadfin Shad, and Bluegill are the important forage species at Lake Murvaul. Trend data on CPUE and size structure of these prey species has been collected biennially since 2004. Continuation of electrofishing sampling in 2022 and 2024, as per Largemouth Bass above, will allow for monitoring of large-scale changes in prey species relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass has been sufficient in collecting the desired numbers of Bluegill for size structure estimation (PSD; 50 fish at a minimum of 12 stations with 80% confidence) and Gizzard Shad size structure (IOV; 50 fish). Data from 2006-2016 has shown RSE $\leq$ 25 for CPUE-Total for Gizzard Shad and Bluegill using the traditional 12 randomly selected stations. No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Gizzard Shad and Bluegill 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. Relative weight of Largemouth Bass $\geq$ 8 inches total length will be determined from their length/weight data (maximum of 10 fish weighed and measured per inch class). Sampling effort based on sampling objectives for Largemouth Bass will also be sufficient to determine presence or absence of Threadfin Shad.

Angler Creel Survey: A roving angler creel survey will be conducted June 2024 through May 2025 to estimate angling effort, catch rates, and expenditures for all sport fish species, listed above. Surveys will be conducted randomly on five weekend days and four weekdays during each three-month quarter.

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Tables and Figures

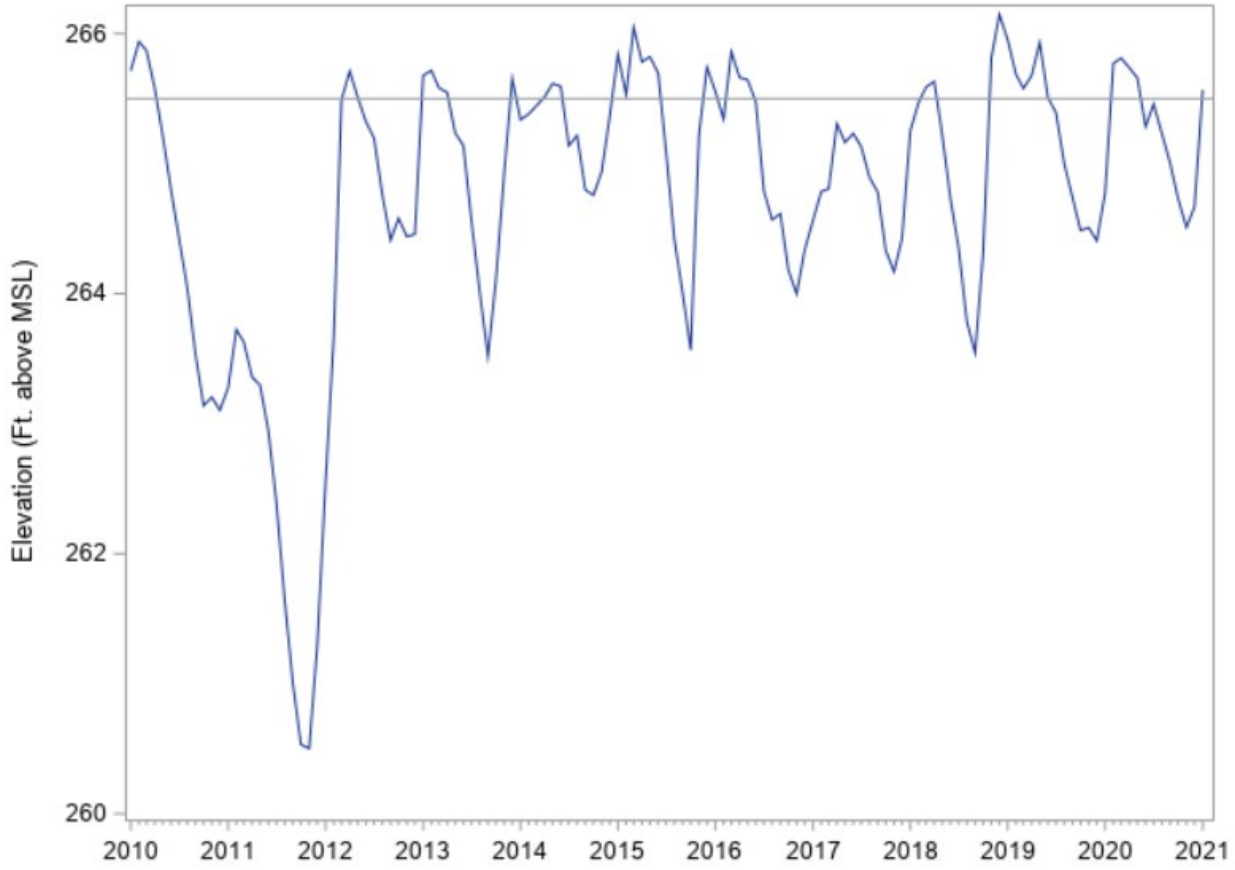


Figure 1. Average monthly water level elevations in feet above mean sea level (MSL) recorded for Lake Murvaul, Texas. Horizontal line indicates conservation pool elevation 265.5 feet MSL.

Table 1. Characteristics of Lake Murvaul, Texas.

Characteristic	Description
Year constructed	1958
Controlling authority	Panola County Fresh Water District
County	Panola
Reservoir type	Tributary
Shoreline Development Index (SDI)	6.7
Conductivity	116 µS/cm

Table 2. Boat ramp characteristics for Lake Murvaul, Texas, August 2020. Reservoir elevation at time of survey was 265.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Condition
Decker-Hill Park	32.04120 -94.42994	Y	30	Excellent, no access issues
FM 1971 Bridge (Dodson Landing)	32.03379 -94.48235	Y	10	Good, potholes near ramp pose potential hazard
Rosie Jones Park	32.04475 -94.47401	Y	10	Poor, rough roads leading to boat ramp, ramp broken
Tinkle Park	32.02006 -94.43595	Y	10	Adequate, ramp is in good condition, but rough roads leading to boat ramp

Table 3. Harvest regulations for Lake Murvaul, Texas.

Species	Bag Limit	Length limit
Catfish, Channel	25	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, Largemouth	5 (only 1 fish ≥ 21 inches)	14- to 21-inch slot
Crappie, White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Lake Murvaul, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults, UNK = unknown.

Species	Year	Number	Life Stage
Channel Catfish	1967	3,000	AFGL
	1968	6,000	AFGL
	1969	5,000	AFGL
	1973	3,000	AFGL
	1979	181,084	AFGL
	Total	198,084	
Florida Largemouth Bass	1972	200	AFGL
	1980	380	ADL
	1989	6	ADL
	1997	95,235	FGL
	1998	95,000	FGL
	1999	102,680	FGL
	2008	171,250	FGL
	2009	177,523	FGL
	2011	172,038	FGL
	2014	173,655	FGL
	2016	44,283	FGL
	2018	57,883	FGL
	2020	65,819	FGL
	Total	1,155,952	
Largemouth Bass	1972	10,000	UNK
	Total	10,000	
ShareLunker Largemouth Bass	2020	938	AFGL
	Total	938	

Table 5. Objective-based sampling plan components for Lake Murvaul, Texas 2017–2021.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 14 inches	N = 13, 13.0 – 14.9 inches
	Condition	W_r	10 fish/inch group (max)
Bluegill [a]	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad [a]	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
Threadfin Shad			Presence/Absence
Trap netting			
Crappie	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Age-and-growth	Age at 10 inches	N = 13, 9.0 – 10.9 inches
Gill netting			
Channel Catfish	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 100 stock
	Condition	W_r	10 fish/inch group (max)
Tandem hoop netting			
Channel Catfish	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure		N ≥ 100 stock
	Condition	W_r	10 fish/inch group (max)

[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 provided information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Survey of structural habitat types, Lake Murvaul, Texas, 2012. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Bulkhead with boat docks	6.2 miles	18.8
Natural shoreline	17.5 miles	52.6
Natural shoreline with boat docks	8.7 miles	26.3
Rocky	0.8 miles	2.3
Standing timber	1377.0 acres	36.0

Table 7. Survey of aquatic vegetation, Lake Murvaul, Texas, 2018–2020. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2017	2018	2019	2020
Native submersed				< 1
Native floating-leaved				< 1
Native emergent				69.0 (2.0)
Non-native				
Alligatorweed (Tier III)	0	0	< 1	< 1
Giant salvinia (Tier II)*	89.0 (2.5)	24.0 (0.7)	3 (0.1)	< 1
Hydrilla (Tier III)*	0	0	0	0
Water hyacinth (Tier III)*	< 1	0	0	0

*Tier I is Immediate Response, Tier II is Active Management, Tier III is Watch Status

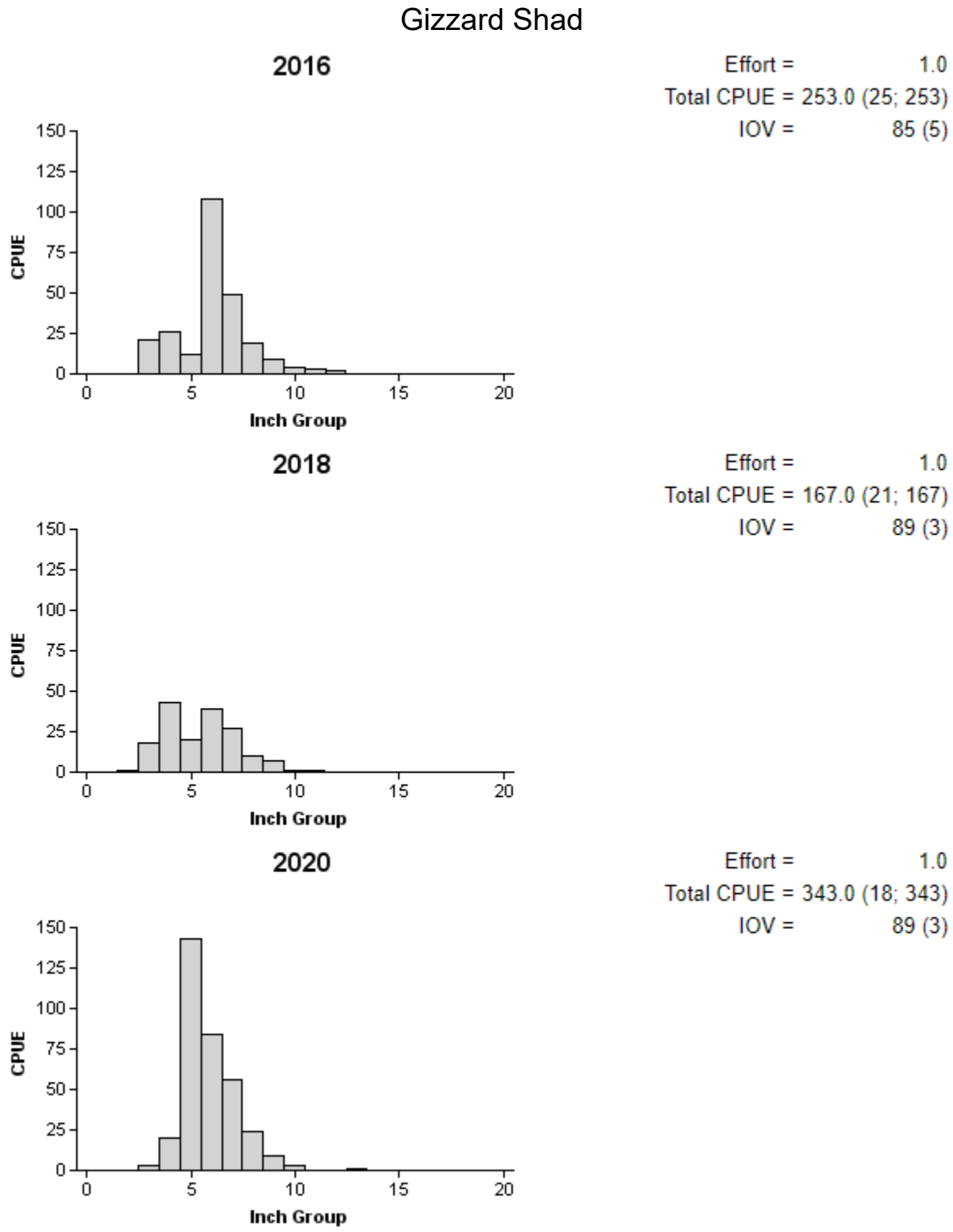


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Murvaul, Texas, 2016, 2018, and 2020.

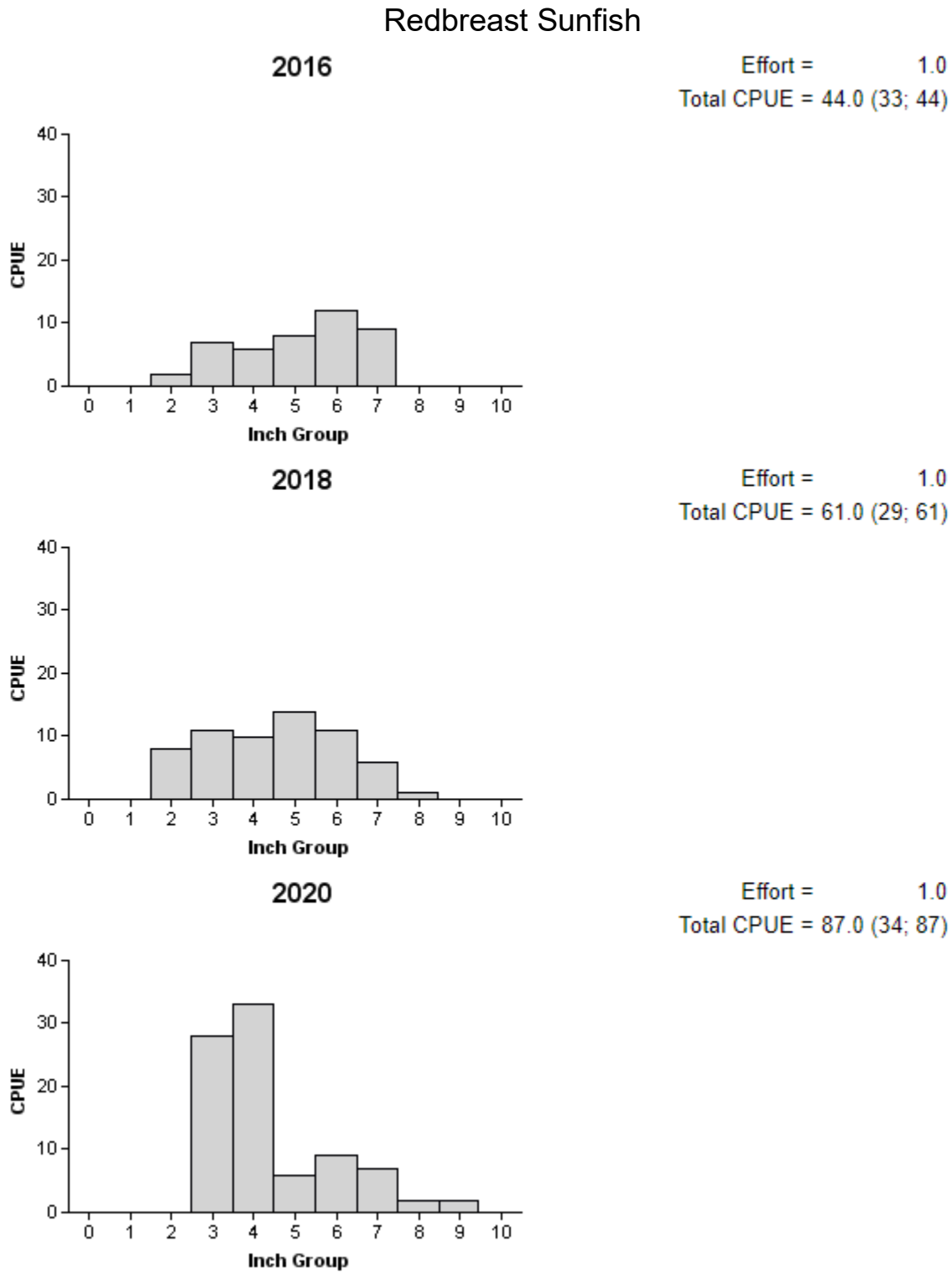


Figure 3. Number of Redbreast Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Murvaul, Texas, 2016, 2018, and 2020.

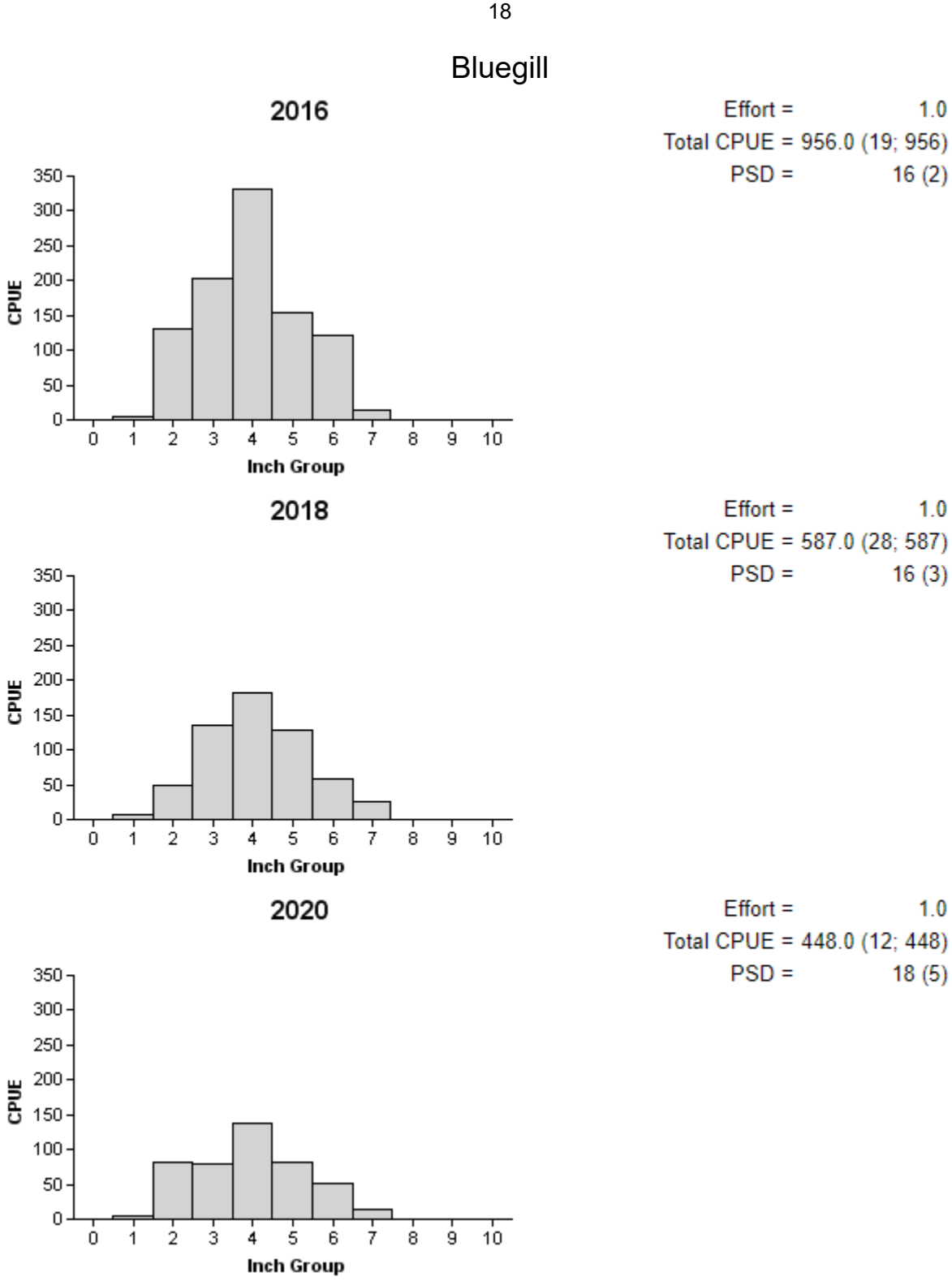


Figure 4. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Murvaul, Texas, 2016, 2018, and 2020.

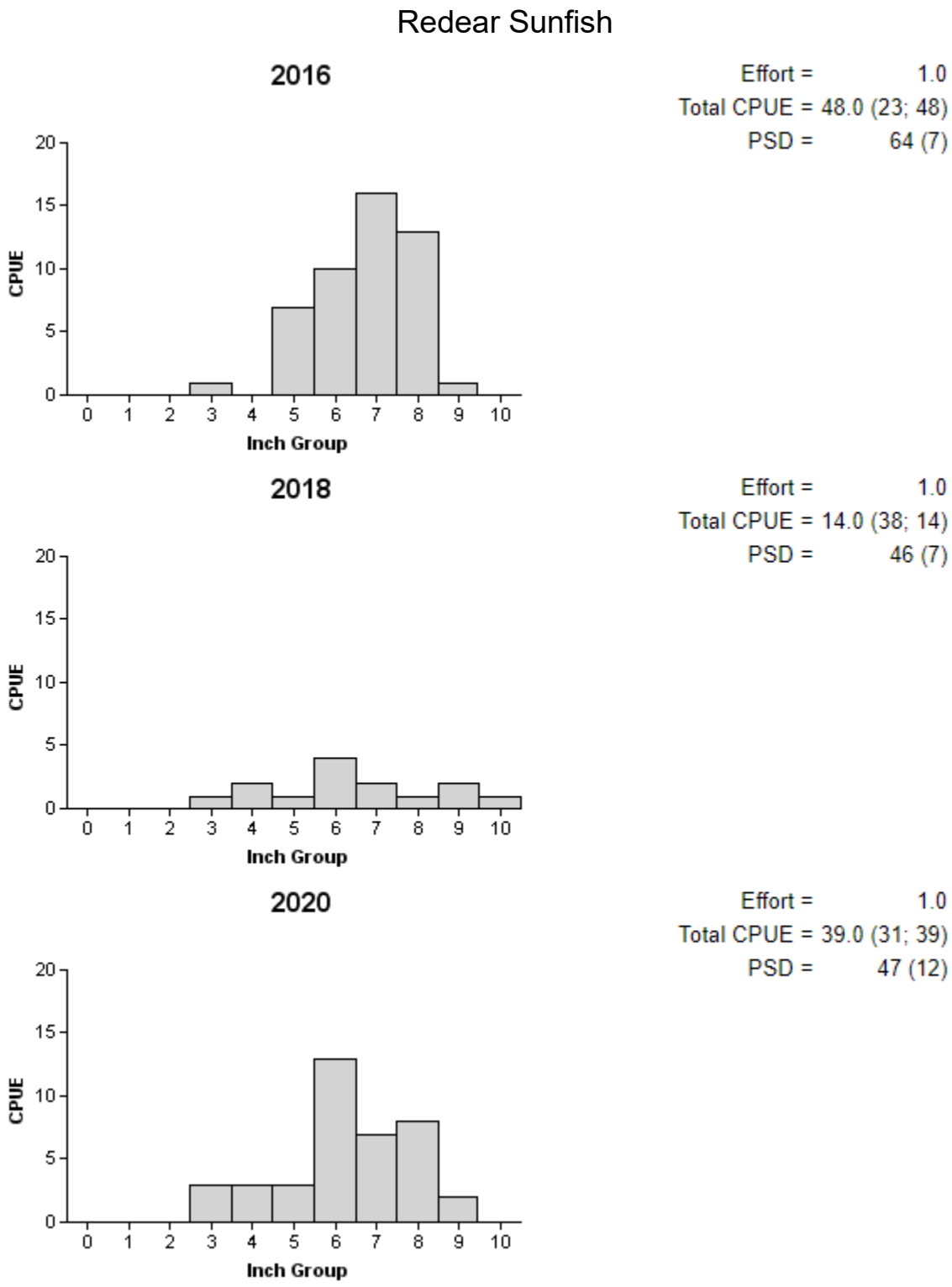


Figure 5. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Murvaul, Texas, 2016, 2018, and 2020.

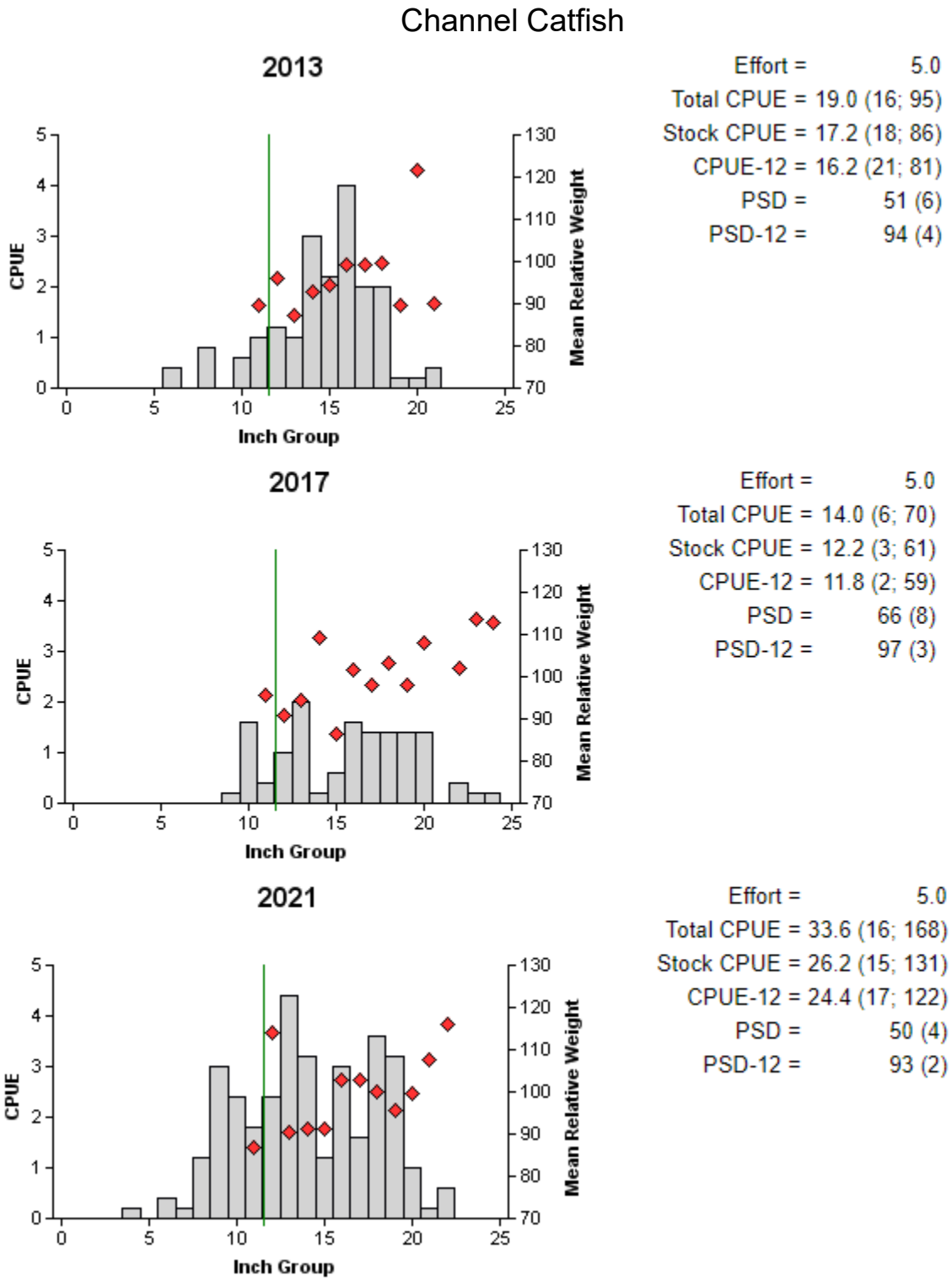


Figure 6. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Murvaul, Texas, 2013, 2017, and 2021. Vertical line indicates the minimum length limit.

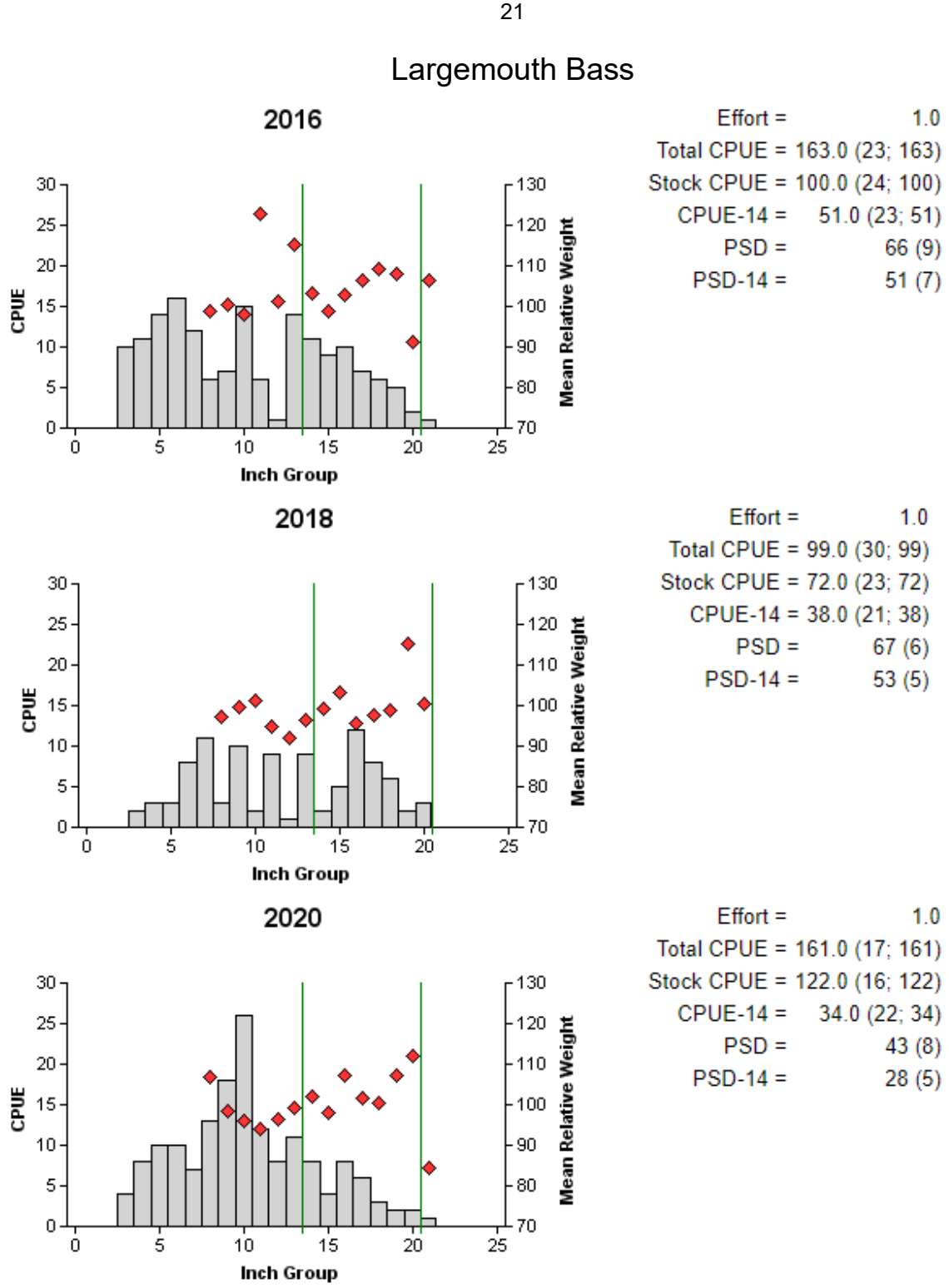


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Murvaul, Texas, 2016, 2018, and 2020. Vertical lines indicate the lower and upper end of the slot-length limit.

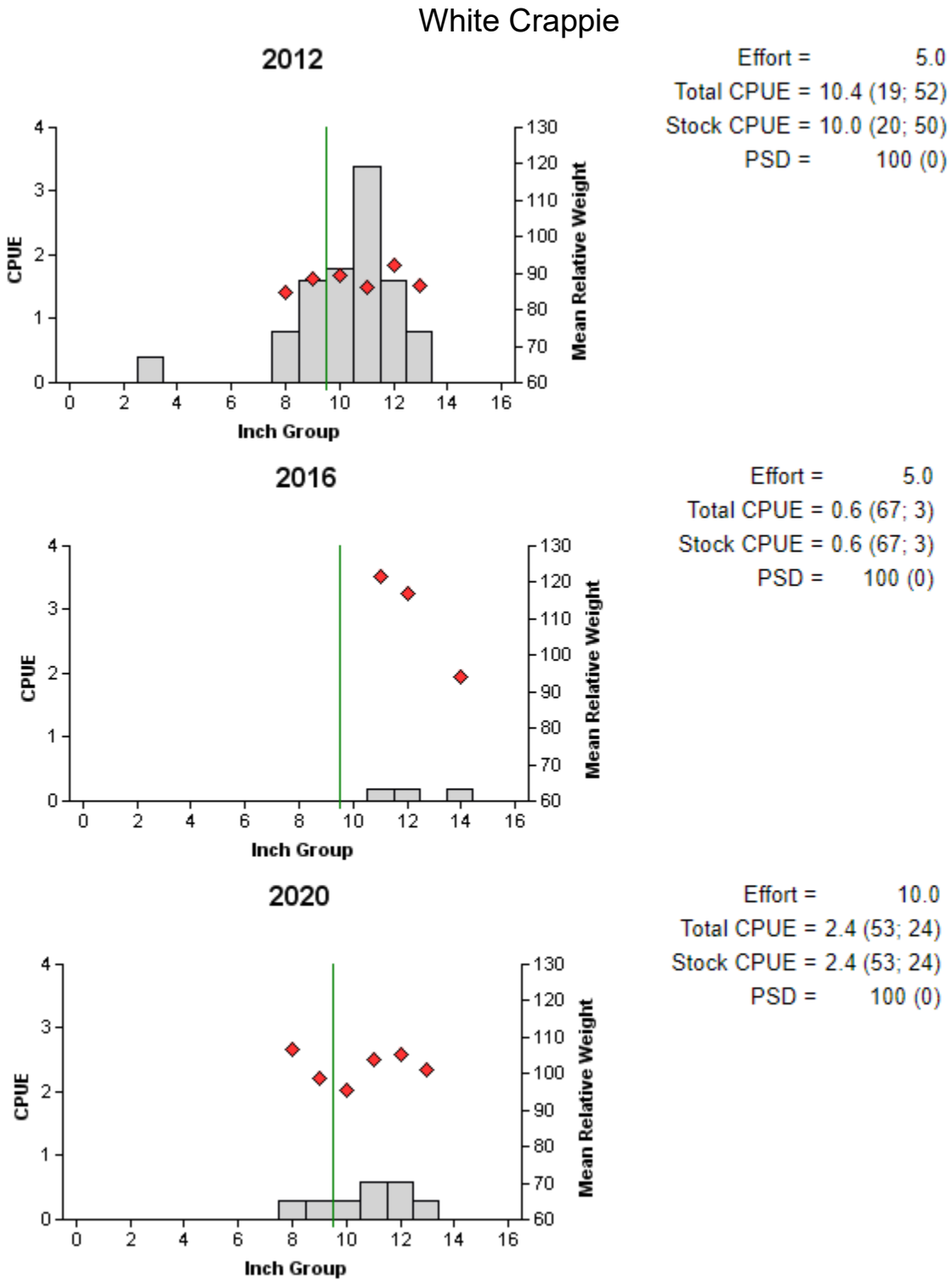


Figure 8. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Lake Murvaul, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.

Black Crappie

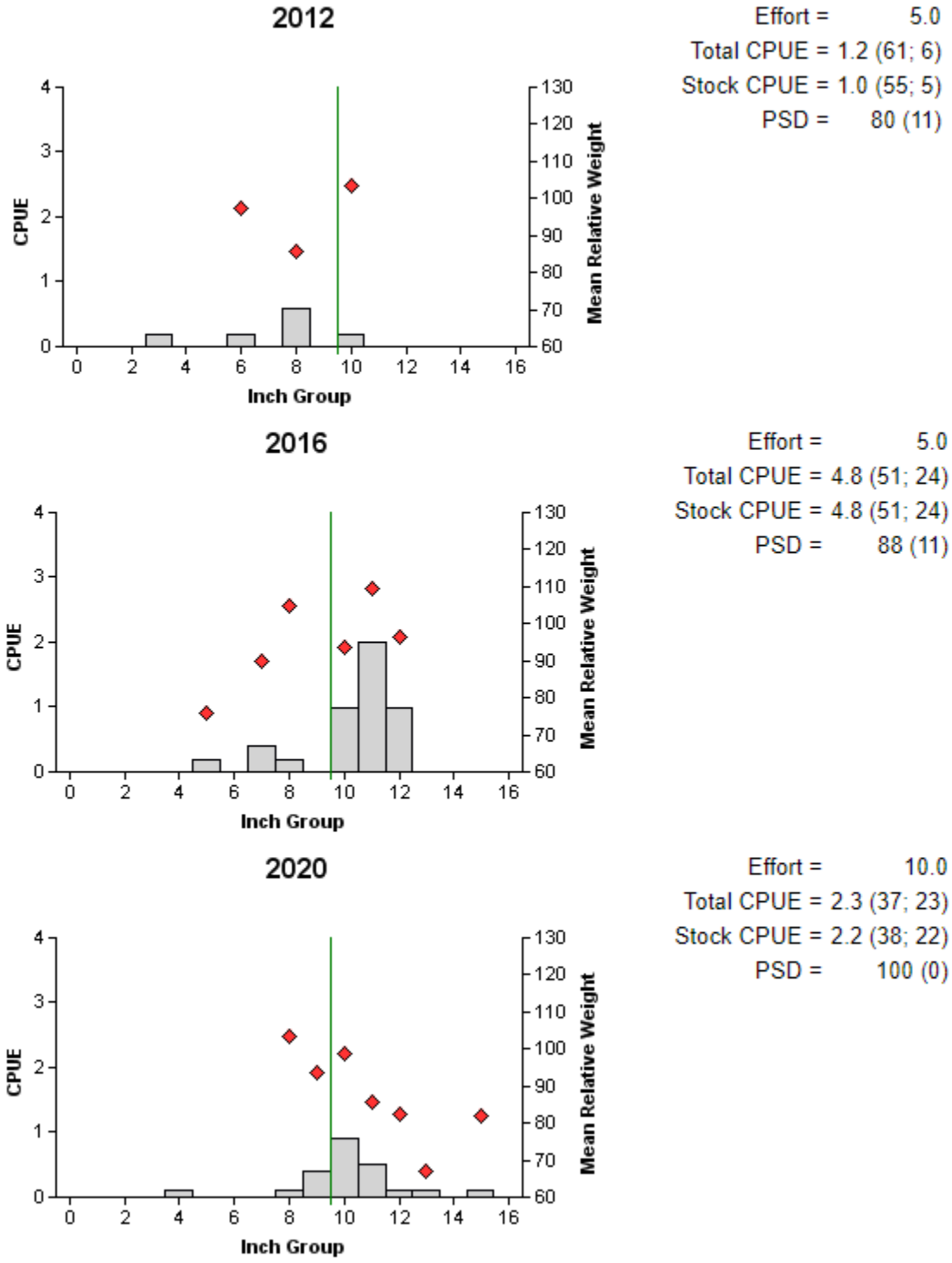


Figure 9. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Lake Murvaul, Texas, 2004, 2008, and 2012. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 8. Proposed sampling schedule for Lake Murvaul, Texas. Survey period is June through May. Gill netting and hoop netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall.

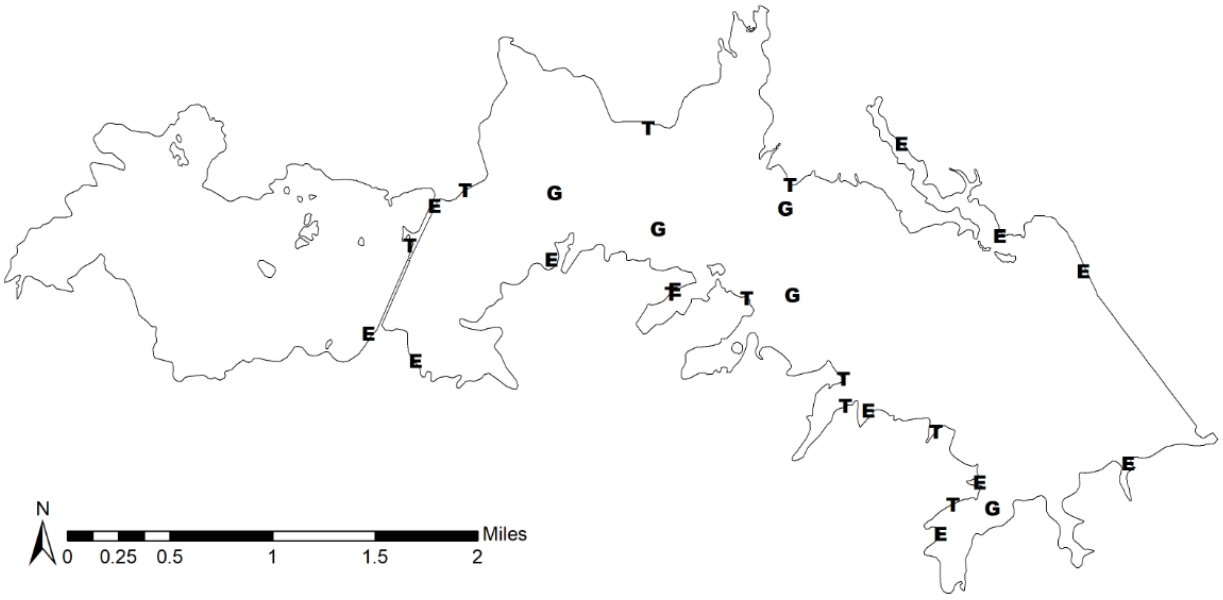
	Survey year			
	2021-2022	2022-2023	2023-2024	2024-2025
Angler Access				X
Structural Habitat				X
Vegetation	X	X	X	X
Electrofishing – Fall		X		X
Trap netting		X		X
Gill netting		X		X
Baited tandem hoop netting		X		X
Creel survey				X
Report				X

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Lake Murvaul, Texas, 2018-2021. Sampling effort was 5 net nights for gill netting, 10 net nights for trap netting, and 1 hour for electrofishing.

	Electrofishing 2018		Electrofishing 2020		Trap Netting		Gill Netting	
Species	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad	167	167.0 (21)	343	343.0 (18)				
Threadfin Shad	366	366.0 (38)	169	169.0 (36)				
Channel Catfish							168	33.6 (16)
Redbreast Sunfish	61	61.0 (29)	87	87.0 (34)				
Warmouth	1	1.0 (100)	1	1.0 (100)				
Bluegill	587	587.0 (28)	448	448.0 (12)				
Longear Sunfish	85	85.0 (37)	41	41.0 (38)				
Redear Sunfish	14	14.0 (38)	39	39.0 (31)				
Largemouth Bass	99	99.0 (30)	161	161.0 (17)				
White Crappie					24	2.4 (53)		
Black Crappie					23	2.3 (37)		

APPENDIX B – Map of sampling locations



Location of sampling sites, Lake Murvaul, Texas, 2020-2021. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was near full pool at time of sampling.

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