Lake Fork

2021 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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July 31, 2022

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Survey and Management Summary

Fish populations in Lake Fork were surveyed in 2019 through 2021 using electrofishing and in 2022 with gill nets. Anglers were surveyed from June through May 2018/2019 and 2020/2021 with a creel survey. Historical data are presented with the 2018-2022 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 Fork is a 26,841-acre impoundment located on Lake Fork Creek, a tributary of the Sabine River, approximately five miles northwest of Quitman, Texas and approximately 70 miles east of Dallas, Texas. Primary water uses included municipal water supply and recreation. Prior to a six-foot reservoir drawdown that began in November 2021 water level has remained within 3.0 feet of conservation pool since 2016. Lake Fork has moderate to high productivity. Habitat features consisted of natural shoreline, submersed and emergent vegetation, standing timber and boat docks.

Management History: Important sport fishes include Largemouth Bass, crappies, and Channel Catfish. The 16- to 24-inch slot-length limit continues to be evaluated through electrofishing surveys, and access-point creel surveys. Florida Largemouth Bass were introduced in small reservoirs in the lake basin prior to impoundment and stockings of fingerlings have taken place annually since 1995. Recent efforts to mitigate the loss of fish habitat due to reservoir ageing have included planting buttonbush and several native aquatic species along the lake shoreline. Management of giant salvinia and water hyacinth continues to be a priority.

Fish Community

- **Prey species:** Threadfin Shad were abundant in the reservoir. Electrofishing catch rate of Gizzard Shad was moderate and 69% were available as prey to most sport fish. Electrofishing catch rate of sunfish was moderate and most were less than 6-inches long.
- **Catfishes:** Directed effort and harvest in the most recent creel survey increased from previous surveys; Channel Catfish continued to provide a quality fishery and angler catch rates were comparable to previous surveys. Blue Catfish were observed in the gill net survey for the second consecutive time (2018 and 2022) and harvested fish were documented in the most recent creel survey; Blue Catfish hadn't been observed for over 20 years prior to the 2018 survey. Anecdotal evidence indicates a quality Flathead Catfish fishery is present in the reservoir.
- **Temperate Bass:** White Bass and Yellow Bass were present in the reservoir however angler interest remains low. The 2022 White Bass gill net catch rate increased from previous surveys, likely from a strong year class in 2020. Naturally occurring White Bass x Yellow Bass hybrids have been documented in the reservoir.
- **Largemouth Bass:** Fall electrofishing catch rate declined in 2021, suggesting poor recruitment from the 2021-year class. Spring electrofishing catch rates have remained stable since 2017. Directed effort for Largemouth Bass continued to be high. Prior to the 2020/2021 creel, the proportion of tournament related effort had steadily increased (40-55% of total bass effort). Few Largemouth Bass were harvested by anglers and most fish retained by anglers were in live release tournaments.
- **Crappie:** Black and White Crappie were present in the reservoir and continued to provide a popular fishery. Crappie were the second most popular species targeted during the most recent creel survey, accounting for 26% of all angling effort. Directed effort and harvest of crappie substantially increased from previous creel surveys.

Management Strategies: Continue stocking Florida Largemouth Bass to maintain the potential catch of trophy fish. Collaborate with the Lake Fork Sportsman Association, Sabine River Authority and other partners in ongoing habitat improvement efforts. Work with TPWD Aquatic Habitat Enhancement team and SRA to manage water hyacinth and giant salvinia. Inform Lake Fork anglers about ongoing management and research efforts. Continue managing Largemouth Bass with a 16-to-24-inch protective slot limit.

Introduction

This document is a summary of fisheries data collected from Lake Fork in 2018-2022. 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 2018-2022 data for comparison.

Reservoir Description

Lake Fork is a 26,841-acre reservoir impounded in 1980 on Lake Fork Creek and Caney Creek, tributaries of the Sabine River. It is located approximately five miles northwest of Quitman, Texas, in Wood, Rains, and Hopkins counties. It is operated and controlled by the Sabine River Authority (SRA) primarily as a municipal water supply and for recreation. Dallas Water Utilities, the City of Quitman, and Bright Star Salem Supply Corporation all pull water directly from the reservoir. The reservoir was eutrophic with a Carlson's Trophic State Index chl-a of 55.76 (Texas Commission on Environmental Quality 2020). Aquatic vegetation coverage is limited, representing 3% of reservoir surface area. Giant and common salvinia, along with water hyacinth are present in the reservoir; however, recently these species have not been abundant. The reservoir recovered from a 3-year drought in May 2015 and remained within 3 feet of conservation pool prior to a six-foot draw down for dam repairs that began in November 2021 (Figure 1). Other descriptive characteristics for Lake Fork are shown in Table 1.

Angler Access

Lake Fork has four boat ramps maintained by the SRA plus numerous private ramps that are accessible for a fee. Additional boat ramp characteristics are in Table 2. Shoreline access is available at all boat ramps, and the SRA day-use area.

Management History

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

1. Stock Florida Largemouth Bass (FLMB) annually at 1,000 fish/km of shoreline.

   Action: Approximately 500,000 FLMB fingerlings were stocked annually.

2. Work with the Lake Fork Sportsman Association (LFSA) to conduct habitat improvements around the reservoir.

   Action: Buttonbush saplings were planted annually from 2011-2019. Projects through the Conservation License Plate program and Reservoir Fisheries Habitat Partnership helped fund the purchase of artificial structures; PVC cubes and similar commercial structures have been deployed at 18 sites around the reservoir.

3. Continue to monitor "Wetland cell" on SRA property and document any successful spread of aquatic vegetation from the wetland into the reservoir.

   Action: Annual monitoring and maintenance of the wetland cell is ongoing. While conceptually functioning correctly, there has not been documented spread of aquatic vegetation from the wetland into the reservoir.

4. Work with the SRA and TPWD Aquatic Habitat Enhancement team (AHE) to monitor and manage giant salvinia and water hyacinth in the reservoir.

   Action: The reservoir is surveyed annually to determine the presence, location and abundance of both species. Containment booms have been deployed in Chaney and White Oak creeks periodically, to limit the spread of salvinia from both locations.

Herbicide treatments have been conducted annually, as needed, to reduce the spread of both species.

5. Promote all fisheries resources of Lake Fork through local and social media outlets.

   Action: Press releases and social-media-based interviews have been routinely conducted.

Harvest regulation history: From 1980 to 1985, Largemouth Bass were managed with a 14-inch minimum length limit. Since that time a series of slot-length limits have been introduced to improve population size structure.

- 1985 – 14- to 18-inch slot-length limit, 5-fish bag limit
- 1990 – 14- to 21-inch slot-length limit, 3-fish bag limit
- 1992 – 14- to 21-inch slot-length limit, 3-fish bag limit, 1 fish ≥21-inches
- 1995 – 14- to 21-inch slot-length limit, 5-fish bag limit, 1 fish ≥21-inches
- 1998 – 16- to 22-inch slot-length limit, 5-fish bag limit, 1 fish ≥22-inches
- 1999 – 16- to 23-inch slot-length limit, 5-fish bag limit, 1 fish ≥23-inches
- 2000 – 16- to 24-inch slot-length limit, 5-fish bag limit, 1 fish ≥24-inches

In 1991 the 10-inch minimum length limit on crappies was removed from December through February because of angler concerns of mortality of fish caught at depth. Anglers were required to retain the first 25 fish to reduce waste of the resource. Current regulations are found in Table 3.

Stocking history: Lake Fork has an extensive history of stocking FLMB that was initiated prior to impoundment in small reservoirs in the lake basin. These reservoirs were inundated after impoundment. Since 1995, fingerlings have been stocked annually. Limited numbers of ShareLunker Largemouth Bass fingerlings have been stocked since 2006. Other species (e.g., Spotted Bass, Channel Catfish, Blue Catfish, Flathead Catfish, Coppernose Bluegill, and Redear Sunfish) were stocked prior to 1985.The complete stocking history is in Table 4.

Vegetation/habitat management history:

Lake Fork has traditionally supported a diverse mix of aquatic submersed and emergent species. Water hyacinth was first documented in Glade Creek in 1993 but agency efforts to control the infestation were hampered by a moratorium on spraying in 1998. By the time treatment was resumed in 2001, plants had spread throughout the reservoir. AHE staff have provided periodic chemical control of water hyacinth using materials provided by the SRA. Independent spray contractors were hired to treat water hyacinth in summer 2010, summer and fall 2016 and summer 2017 when infestations increased above the levels that AHE could treat. Giant salvinia was first documented in November in 2015 in Chaney Branch. The infestation was managed through the installation of floating booms, physical removal of plants and herbicide applications by AHE staff. In September 2017 the containment booms were removed when no further plants were observed. One month later, a new infestation was found in White Oak Bay followed by installation of a floating boom and herbicide treatments by AHE staff. Alligatorweed was the most common aquatic species targeted by homeowners through the aquatic vegetation treatment proposal process. District releases of alligatorweed fleabeetles in 2009 and 2010 had no appreciable impact on alligatorweed so future efforts were discontinued.

TPWD worked in cooperation with the LFSA to plant buttonbush along the shoreline from 2011 to 2019 in efforts to enhance littoral habitat. Since 2013 LFSA volunteers in conjunction with students at Yantis High School have grown out plants in a greenhouse at the school using Kills and Spills Restitution funds. District staff planted waterwillow harvested from Lake Holbrook in 2012 and 2014 to encourage establishment of native emergent species. Water willow was again planted in 2020 in Glade and Mustang

creeks. LFSA also assisted with construction and deployment of 60 Georgia-style PVC attractors at 18 sites in Lake Fork in 2015 and 2019.

Eelgrass and variable-leaf watermilfoil were planted in Alligator Cove in 2021 within enclosure cages in attempts to establish submersed vegetation in areas of the reservoir that historically had abundant vegetation (primarily hydrilla).

Water transfer: No interbasin transfers exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Fork (Storey and Cartabiano 2018). Primary components of the OBS plan are listed in Table 5. 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 (1.5 hours at 18, 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).

Gill netting – Blue Catfish, Channel Catfish and White Bass were collected by gill netting (10 net nights at 10 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.

Creel survey – A roving creel survey was conducted from June 2017 through May 2018 and June 2020 through May 2021. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Habitat – An aerial vegetation survey was conducted in 2021. 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 2022).

Results and Discussion

Habitat: Historically, the primary aquatic vegetation on Lake Fork that helped support consistent recruitment of sportfish was comprised primarily of submersed species. Total coverage of submersed vegetation ranged from 4-6% of the reservoir in most years prior to 2011 (peak drought). Submersed vegetation briefly retuned in 2013 (9% coverage) but has slowly declined since. While total vegetation coverage was above 3% (967 surface acres) in 2021, emergent species (alligatorweed and American lotus accounted for over 76% (735 surface acres) of all vegetation present (Table 6). Further, the bulk of the alligatorweed and American lotus present was growing in the very back of creeks and pockets that were heavily silted in. Coontail and pondweed was sparsely distributed throughout the reservoir (138 and 45 surface acres, respectively) and hydrilla was only found in small concentrations (49 acres) on the upper northeast arm in Running and Coffee Creeks. Water hyacinth remained in the reservoir, but management efforts from the AHE team reduced abundance to approximately 10 acers. A trace amount of common salvinia was found in the back of White Oak Bay in 2021. A controlled drawdown was initiated in November 2021 for dam repairs, lowering the reservoir 6 feet below conservation pool; all aquatic vegetation was reduced to trace amounts following the drawdown. While the drawdown reduced littoral habitat for the immediate future, it is possible for a strong rebound in terrestrial and aquatic vegetation when the reservoir returns to conservation pool. The last structural habitat survey was conducted in 2007 (Storey and Jubar 2008).

Creel: Largemouth Bass and crappie were the two most popular sport fish targeted during the most recent creel survey, accounting for 60% and 26% of all directed effort, respectively (Table 7). Crappie effort has increased over the last 4 creel surveys (2015-2021). Total angling effort for the creel period was estimated at 838,322 hours, the highest documented effort since the 2015/2016 creel (943,149

hours). Anglers spent an estimated $9,157,011 in direct expenditures, which was also the highest observed since 2015/2016 ($10,978,715; Table 8).

Prey species: The primary prey base continued to be Threadfin Shad, Gizzard Shad and sunfish. Yellow Bass were also present in the reservoir and offer an additional prey item to larger predators. Electrofishing catch rates of Bluegill and Gizzard Shad were 132.0/h and 231.3/h, respectively. A majority of Gizzard Shad were available to existing predators (IOV = 69; Figure 2). Total CPUE of Gizzard Shad was higher than the previous two surveys (152.5/h, 2017; 193.5/h, 2019). While total CPUE of Bluegill was lower than the previous two surveys (171.0/h, 2017; 213.8/h,2019) the results suggest a moderate but stable bluegill population. Size structure continued to be dominated by small individuals (Figure 3).

Catfish: Blue Catfish have historically not been abundant in Lake Fork. One specimen was collected in a gill net survey in 1997, but no other Blue Catfish were observed until 2018 (Figure 4). However, Blue Catfish gill net catch rates have increased over the last two surveys (0.2/nn; 2018, 1.7/nn; 2022) suggesting an expanding population. It is unclear yet how an expanding Blue Catfish population may impact Channel Catfish and other sportfish populations in the reservoir. The gill net catch rate of Channel Catfish was 14.0/nn in 2022, up from 11.5/nn and 9.1/nn in 2016 and 2018, respectively (Figure 5). The population continues to contain a balanced size structure (PSD=57) with several individuals ≥ 20 inches. Body condition continued to be moderate (average W_r of 85) for fish under 20 inches and increased in larger specimens.

Directed fishing effort, catch per hour, and total harvest for Channel Catfish was 91,690 h, 1.56 fish/h, and 123,529 fish, respectively, from June 2020–May 2021 (Table 9). Harvested fish ranged in length from 12-25 inches (Figure 6). Four harvested Blue Catfish were documented during 2020/2021 creel survey (Figure 7); no Blue Catfish had previously been observed during a creel. Catfish accounted for 11% of total directed fishing effort.

White Bass: White Bass were first detected in 2004 and since established a self-sustaining population. Gill net catch rates have been low and variable over the last three surveys (CPUE range: 0.6/nn – 2.6/nn), suggesting inconsistent recruitment (Figure 8). The 2022 catch rate (2.6/nn) was the highest documented since 2014 (6.3/nn). White Bass directed effort has not been documented since the 2016/2017 creel; very few White Bass were harvested in the most recent creel survey (Figure 9).

Largemouth Bass: The fall 2021 Largemouth Bass electrofishing catch rate (49.3/h) was lower than the previous two fall surveys (2019 and 2020; Figure 10) and was the lowest historically historical catch for the reservoir. Declining catch rates are a direct result of declining littoral habitat and inconsistent year class strength. The historically abundant aquatic vegetation in the reservoir, including hydrilla and Eurasian watermilfoil, were a critical component in supporting a high-density bass population. Lower catch rates (i.e., < 100/h) will likely continue without improvements in littoral habitat. Size structure was similar over the past three surveys indicating a balanced population (PSD range = 43 - 55). Body condition of Largemouth Bass was desirable (W_r ≥ 90) and was consistent across size classes. Growth rate was moderate; average age at 14 inches (13.6 to 14.9 inches) was 2.4 years (N = 13; range = 2-3 years). Florida Largemouth Bass genetic influence has remained relatively constant; the percentage of Florida alleles has ranged from 48-57% since 2006 (Table 10).

The spring 2021 electrofishing catch rate (79.3/h) was comparable to the previous two surveys (2017 and 2018; Figure 11), but still down from historical average catch rates when aquatic vegetation was more abundant. Both size structure (PSD=88) and catch rate (CPUE-16=34) suggest recruitment into the protected slot limit is still adequate.

Directed fishing effort and total harvest for Largemouth Bass were 502,943 h and 927 fish, respectively, over the last creel period (Table 11). Anglers released an estimated 99% of legal fish caught. Approximately 88% (N=137,507) of Largemouth Bass caught and released were less than 4 pounds, 10% (N=16,350) were between 4-7 pounds, 1% (N=1,625) were between 7-10 pounds. and < 1% (105) were over 10 pounds. Prior to the 2020/2021 creel survey, the proportion of overall effort from tournaments

had steadily increased, accounting for 40-55% of effort. It is unclear why tournament-directed effort dropped to 7.5% during the most recent creel. Tournament-caught fish accounted for 43% of all bass retained in livewells, despite the substantial decrease in documented tournament effort. While the majority (82%) of anglers interviewed during the most recent creel survey were from Texas, 10% traveled over 500 miles from other states and 1% traveled over 900 miles (Appendix C).

With a long-term creel dataset for Lake Fork (53 creel quarters surveyed) inferences can be made from analyzing this historic dataset. Significant declines in angler catch rates for Largemouth Bass have occurred in recent years, concurrent with electrofishing abundance estimates and year class strengths. Catch rates during the 2020/2021 creel survey (CPUE = 0.27/h) were the lowest ever observed during an annual creel survey on Lake Fork. Catch rates during the 2018/2019 creel survey (CPUE = 0.33/h) were also among the lowest ever recorded, with only one prior survey (2014/2015, CPUE = 0.31/h) on record with a lower catch rate, other than the 2020/2021 survey. Fluctuations in angler catch rates for Largemouth Bass are largely affected by available littoral habitat and historically, increases in Largemouth Bass angler catch rates on Lake Fork have been associated with large scale increases in reservoir vegetation coverage (Appendix D). Legacy ShareLunkers donated to the program have also displayed similar declines, in conjunction with declining habitat and more variation in water levels (Appendix E).

Crappie: Black and White Crappie historically provided a popular fishery on Lake Fork, accounting for 8-14% of all effort most years. However, the most recent creel survey documented a substantial surge in crappie effort, and subsequently an increase in harvest. Directed fishing effort, catch per hour, and total harvest for crappie was 215,820 h, 1.32 fish/h, and 220,112 fish, respectively, from June 2020 through May 2021 (Table 12). Estimated effort during the previous three creel surveys ranged from 73,807 h – 80,243 h and harvest ranged from 22,197 fish – 96,994 fish. Despite the increases in effort and harvest, angler catch rate remained within the historical range (1.18/h – 1.63/h). Harvested fish during the most recent creel ranged in length from 6-16 inches (Figure 13). Most of the crappie harvested under 10 under inches occurred during the special winter-time crappie regulation.

Fisheries Management Plan for Lake Fork, Texas

Prepared – July 2020

ISSUE 1: Lake Fork has a long and impressive history of producing trophy Largemouth Bass. This lake has held the state record of 18.18 pounds since 1992 and has contributed 45% of all entries into the ShareLunker program since its inception in 1986. To date, 7 of the top 10, 13 of the top 20, and 24 of the 40 heaviest documented Largemouth Bass in Texas were caught in Lake Fork. Total annual trip expenditures at Lake Fork were estimated at over $18.8 million and total economic value of the reservoir for fishing was valued at $38.4 million (Hunt and Parker 2016). TPWD has managed the Lake Fork Largemouth Bass fishery under restrictive regulations since it was opened to the public in 1980 and as part of its commitment to enhancing the quality of the bass population. TPWD has stocked more than 15.5 million FLMB into the lake. The goal of TPWD is to maximize trophy fish abundance to support this world-renowned trophy fishery.

MANAGEMENT STRATEGY

1. Stock FLMB fingerlings every year at 1,000/km of shoreline to maintain the potential catch of trophy fish in the reservoir.
2. Promote TPWD ShareLunker program to improve supplemental reporting of trophy Largemouth Bass catches within the reservoir.

ISSUE 2: Lake Fork historically contained abundant aquatic vegetation, including hydrilla and Eurasian watermilfoil that spread rapidly under the right conditions. While hydrilla is still considered an invasive plant, it has historically not caused access or ecological issues in the Lake Fork watershed and has provided beneficial habitat to the reservoir. The abundant habitat was one of the driving forces in maintaining a high-density Largemouth Bass population. However, littoral habitat has declined over the last eight years and Largemouth Bass relative abundance has declined in unison. Lake Fork will continue to support a lower-density Largemouth Bass population without a significant improvement in aquatic vegetation.

MANAGEMENT STRATEGIES

1. Support cooperative projects with the LFSA, SRA, BASS and other potential partners to introduce aquatic vegetation back into the reservoir.
2. Seek both internal (HAPP, CLP) and external (RFHP, BASS, MLF, etc.) funding sources to support habitat restoration projects.
3. Continue to monitor ongoing vegetation restoration efforts (artificial wetland, enclosure cages, terrestrial grass planting) to identify methods, species, and reservoir locations that significant expansion of introduced species has occurred and expand the successful efforts throughout the reservoir.
4. Seek out new methods of vegetation restoration (floating enclosure cages, terrestrial planting, etc.)

ISSUE 3: Giant salvinia and water hyacinth have remained present in the reservoir and can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these species are significant. Additionally, the Lake Fork watershed is susceptible to the introduction of invasive invertebrates including zebra mussels. 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.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Continue to work with marina owners and provide them with signs, posters, and literature to educate their customers.
3. Educate the public about invasive species through social media, presentations and news releases, when appropriate.
4. Investigate reports of unusual or unknown aquatic plants in Lake Fork by anglers and homeowners at the earliest possible opportunity.
5. Document existing and future inter-basin water transfers to facilitate potential invasive species responses.

ISSUE 4: Lake Fork has a very passionate collection of guides and anglers that care about the current and future status of the reservoir. The continued support from the angling community is critical in maintaining relationships, opinions and public trust in the Department which can positively impact efforts conducted to maintain popular fisheries throughout Texas.

MANAGEMENT STRATEGY

1. Utilize the Tyler District Facebook page to post information on pertinent management and research activities on Lake Fork
2. Work with guides, local anglers, and marina owners to keep the constituent base well informed.
3. Coordinate local meetings, when appropriate, to further educate the angling public and answer pertinent questions.

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

Sport fish, forage fish and other important fishes

Sport fish in Lake Fork include Largemouth Bass, crappie, Channel Catfish, Blue Catfish and White Bass. Important forage species include Gizzard and Threadfin Shad, and sunfishes.

Low-density fisheries

White Bass abundance has fluctuated in the reservoir and gill net surveys have produced low and variable catch rates. The historical data suggests it would take > 50 net nights to estimate size structure or relative abundance with 80% confidence. Large-scale changes for White Bass will be monitored with creel surveys in 2022/2023 and 2024/2025.

Survey objectives, fisheries metrics and sampling objectives

Crappie: Historical trap net data fluctuated among survey years; catch rates were very dependent upon sample location resulting in overall poor survey precision. Due to the unpredictability of trap net survey success and the large sample size required to reliably estimate crappie trend data (CPUE, PSD, W_r), trap net surveys were discontinued in 2007. Inferences about the crappie population and identification of

potential applied management actions will be made from data collected with creel surveys in 2022/2023 and 2024/2025.

Catfish: Catfish remained an important species and accounted for 11% of directed angler effort during the last creel survey. **H**istorical gill net data suggests Channel Catfish population indices (CPUE, PSD, W_r) can be estimated with acceptable precision (RSE < 25) and sample size (N ≥ 50 stock-size fish) with only 10 net-nights of gill net effort at least 80% of the time. Channel Catfish population trend data (CPUE and PSD) will be monitored every four years in order to detect any large-scale fluctuations. In the spring of 2026, 10 gill nets will be set, with up to 10 additional nets set, in order to achieve a precise estimate (RSE < 25) of abundance and an acceptable size-structure estimate (N ≥ 50 stock-size fish).

The 2022 gill net survey documented a potentially establishing Blue Catfish population; it will be critical to continue documenting Blue Catfish collected in gill net surveys to further document population expansion. In accordance with Channel Catfish sampling, 10 gill nets will be set in Spring 2026, with up to 10 additional nets, in attempts to estimate Blue Catfish relative abundance and size structure. No additional effort will be conducted if survey objectives are not met after 20 total net nights. However, lower precision (RSE<35) of CPUE estimates will be acceptable, if necessary, to monitor changing Blue Catfish population indices and determine further sampling needs.

Largemouth Bass: Largemouth Bass are the most popular sport fish in Lake Fork and receive high angling pressure (18.4 angling hours/acre). The reservoir is ranked annually as one of the top bass fisheries in the country and routinely hosts tournaments from professional tours and several annual big-bass events. Due to the relative importance of this fishery, Largemouth Bass trend data on relative abundance, size structure, body condition, and growth (CPUE, PSD, W_r, average age at 14 inches)) will continue to be monitored with biennial spring (2024 and 2026) and fall (2023 and 2025) nighttime electrofishing. The spring sampling will provide better insights into the population size structure and abundance of larger fish. The historical fall electrofishing data suggests that sampling objectives (RSE ≤ 25, N > 50) can be met with 12-18 randomly selected 5-minute sampling sites. Up to an additional 6 stations will be sampled, if necessary, to complete survey objectives. Otoliths will be removed from 13 specimens (13.0- 14.9 inches) during the 2025 survey for age and growth analysis.

Prey Species: Gizzard Shad, Threadfin Shad and sunfish are important prey species in Lake Fork. Long-term trend data is desired for these populations to evaluate their relative abundance (CPUE) and size structure (PSD). Relative weights of the Largemouth Bass population, along with size structure of Bluegill and the IOV of Gizzard Shad, will be used to gauge prey fish availability for sport fishes from electrofishing sampling conducted in fall 2023. No sampling objectives will be set for prey species.

Angler Data: Lake Fork contributes approximately $40 million annually to the surrounding economy, and anglers spend roughly $8 - $10 million annually on direct fishing expenditures. The reservoir draws anglers from across the country and overseas. The high-profile nature of this fishery warrants intensive sampling to accurately characterize angler utilization. Angler trend data will continue to be monitored biennially with access-point creels from June through May 2022/2023 and 2024/2025. Each creel quarter will consist of 5 randomly selected weekend days and 4 randomly selected weekdays.

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Tables and Figures

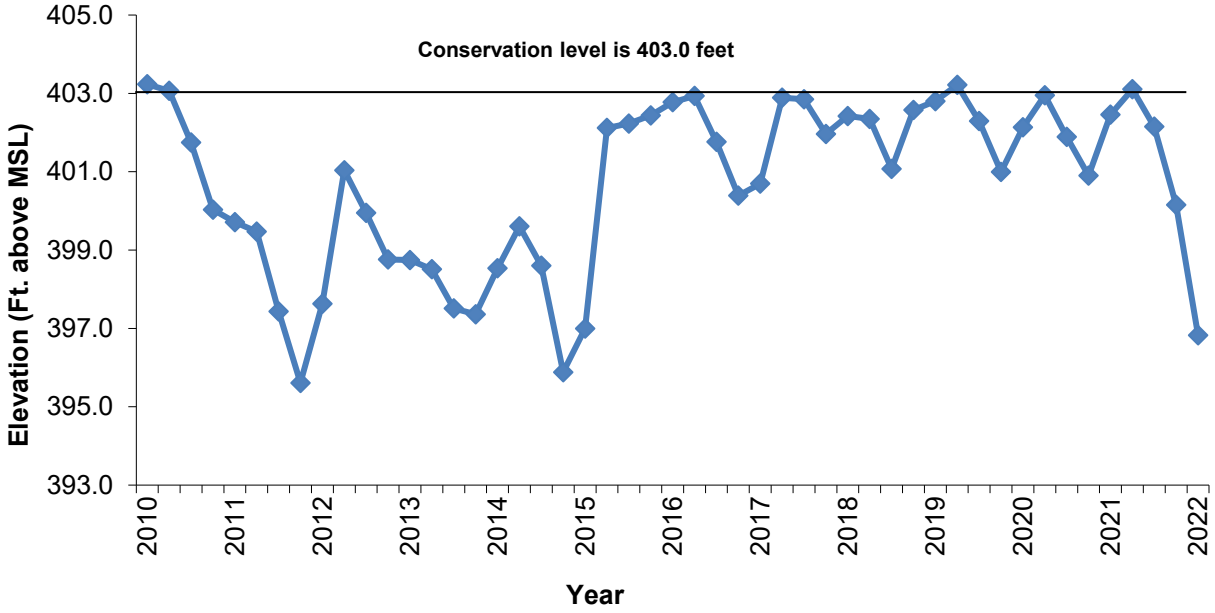


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Fork, Texas.

Table 1. Characteristics of Lake Fork, Texas.

Characteristic	Description
Year constructed	1980
Controlling authority	Sabine River Authority
Counties	Wood, Hopkins and Rains
Reservoir type	Tributary
Shoreline Development Index	12.18
Conductivity	135 µS/cm

Table 2. Boat ramp characteristics for Lake Fork, Texas September, 2021. Reservoir elevation at time of survey was 400.9 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Rainswood	32.9037 -95.6587	Y	30	393.85	Excellent, no access issues
Highway 17	32.8787 -95.6329	Y	60	392.35	Excellent, no access issues
Highway 154	32.8527 -95.5289	Y	50	393.25	Excellent, no access issues
Highway 515 East	32.8951 -95.5356	Y	50	391.35	Excellent, although sand occasionally accumulates on ramp limiting access

Table 3. Harvest regulations for Lake Fork, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	None[a]
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5[b]	16 to 24-inch slot
Crappie: White and Black Crappie, their hybrids and subspecies	25[c] (in any combination)	10-inch minimum

[a] Only 10 combined Blue and Channel Catfish ≥ 20 inches may be retained per day.

[b] Only 1 Largemouth Bass ≥ 24 inches may be retained per day.

[c] Minimum length limit is waived from December 1 to the last day of February. Anglers must harvest first 25 crappie caught, regardless of size. No culling is allowed.

Table 4. Stocking history of Lake Fork, Texas. FGL = fingerling; AFGL = advanced fingerling; FRY = fry; ADL = adult.

Species	Year	Number	Size
Blue Catfish	1980	268,423	FGL
	1984	29,676	FGL
	1985	253,464	FGL
	Total	551,563	
Channel Catfish	1977	37,787	FGL
	1978	80,130	FGL
	1980	137,545	FGL
	1984	102,103	FGL
	Total	357,565	
Flathead Catfish	1979	4,800	FGL & ADL
Redear Sunfish	1981	36,000	FGL
Coppernose Bluegill	1981	633,911	FGL
Spotted Bass	1979	41	ADL
Florida Largemouth Bass	1978	103	ADL
	1979	740,815	FGL
	1979	561	ADL
	1980	330,800	FRY
	1980	300	ADL
	1982	49	ADL
	1987	250	AFGL
	1995	692,281	FGL
	1996	697,731	FGL
	1997	697,337	FGL
	1998	693,311	FGL
	1999	710,661	FGL
	2000	510,558	FGL
	2001	218,096	FGL
	2002	692,158	FGL
	2003	731,714	FGL
	2004	514,961	FGL
	2005	683,876	FGL
	2006	501,263	FGL
	2007	501,174	FGL
	2008	501,070	FGL
	2009	682,622	FGL
	2010	512,634	FGL
	2011	684,949	FGL
	2012	683,484	FGL
	2013	518,940	FGL
	2014	502,304	FGL
	2015	317,854	FGL
	2016	317,315	FGL

Table 4. Continued

Species	Year	Number	Size
	2017	320,261	FGL
	2018	311,910	FGL
	2019	529,239	FGL
	2020	301,132	FGL
	2021	471,836	FGL
	Total	15,573,549	
ShareLunker Largemouth Bass	2006	4,800	FGL
	2008	2,897	FGL
	2009	3,000	FGL
	2010	2,220	FGL
	2011	39,872	FGL
	2012	10,205	FGL
	2013	4,559	FGL
	2014	15,709	FGL
	2018	35,998	FGL
	2019	14,566	FGL
	2021	21,250	FGL
	Total	155,076	

Table 5. Objective-based sampling plan components for Lake Fork, Texas 2021–2022.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Relative 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)
	Genetics	% FLMB	N = 30, any age
Bluegill [a]	Relative abundance	CPUE–Total	
	Size structure	PSD, length frequency	
Gizzard Shad [a]	Relative abundance	CPUE–Total	
	Prey availability	IOV	
Threadfin Shad [a]	Relative abundance	CPUE-Total	
Gill Netting			
Channel Catfish	Relative abundance	CPUE– stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Condition	W_r	10 fish/inch group (max)
Creel Survey			
Largemouth Bass, Catfish, Crappie and White Bass	Angler trend information	Angler effort, CPUE, harvest and size structure	

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

Table 6. Survey of aquatic vegetation, Lake Fork, Texas, 2006–2021. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2004	2006	2007	2009	2013	2015	2017	2021
Emergent	145	371 (1)	450 (1)		130 (<1)		495 (2)	
Submersed	1,278	543 (2)	571 (2)		1,069 (4)		202 (<1)	
American lotus								271(<1)
Coontail								138 (<1)
Pondweed								45 (<1)
Alligatorweed (Tier III)*			42 (<1)		3 (<1)		55 (<1)	464 (2)
Eurasian watermilfoil (Tier III)*	58 (<1)	184 (<1)	418 (2)					
Giant cane (Tier III)*							trace	
Hydrilla (Tier III)*	2,156 (8)	1,047 (4)	417 (2)		1,372 (5)		12 (<1)	49 (<1)
Water hyacinth (Tier II)*	49 (<1)	10 (<1)	12 (<1)	400.0 (2)	4 (<1)		274 (1)	10 (<1)
Common salvinia (Tier II)*								0.5
Giant salvinia (Tier 1)*						3 (<1)	2(<1)	
Total		2,155 (8)	2,359 (9)		2,578 (10)		1,037 (4)	967 (3)

* Tier I is immediate response, Tier II is maintenance, Tier III is Watch Status

Table 7. Percent directed angler effort by species for Lake Fork, Texas, 2015 - 2021. Survey period was June 1 through May 31.

Species	2015/2016	2016/2017	2018/2019	2020/2021
Catfish	8.3	5.9	6.9	10.9
Temperate bass	1.6	0.9	0.0	0.0
Sunfish	0.2	0.1	0.0	0.0
Largemouth Bass	81.5	76.5	76.7	60.0
Crappie	7.8	13.0	14.4	25.7
Anything	0.6	3.6	2.0	3.3

Table 8. Total fishing effort (h) for all species and total directed expenditures at Lake Fork, Texas, 2015 - 2021. Survey period was June 1 through May 31. Relative standard error is in parentheses.

Creel statistic	2015/2016	2016/2017	2018/2019	2020/2021
Total fishing effort	943,149 (20)	617,698 (15)	513,086 (23)	838,322 (29)
Total directed expenditures	$10,978,715 (25)	$7,649,981 (27)	$8,030,425 (32)	$9,157,011 (51)

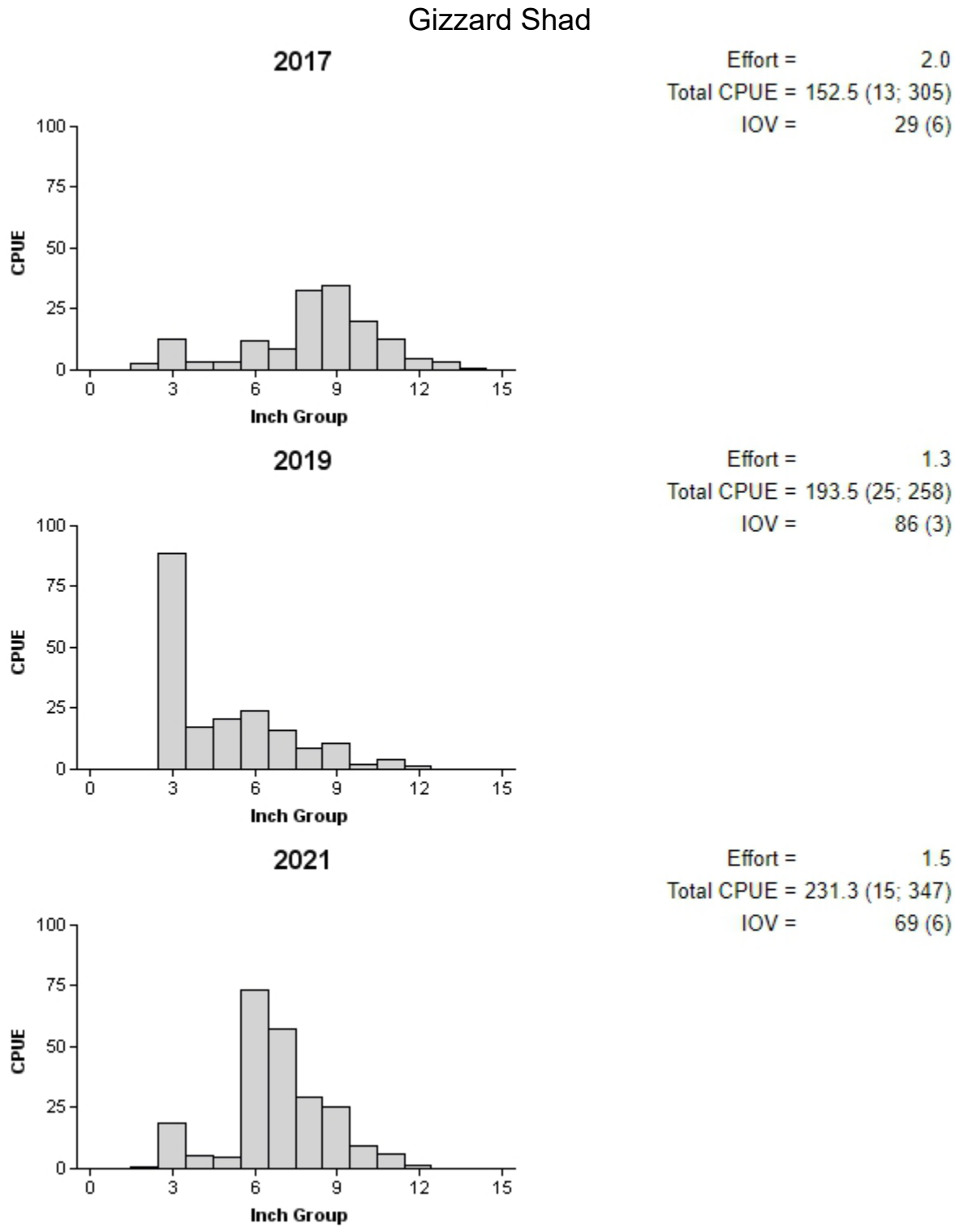


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Fork, Texas, 2017, 2019 and 2021.

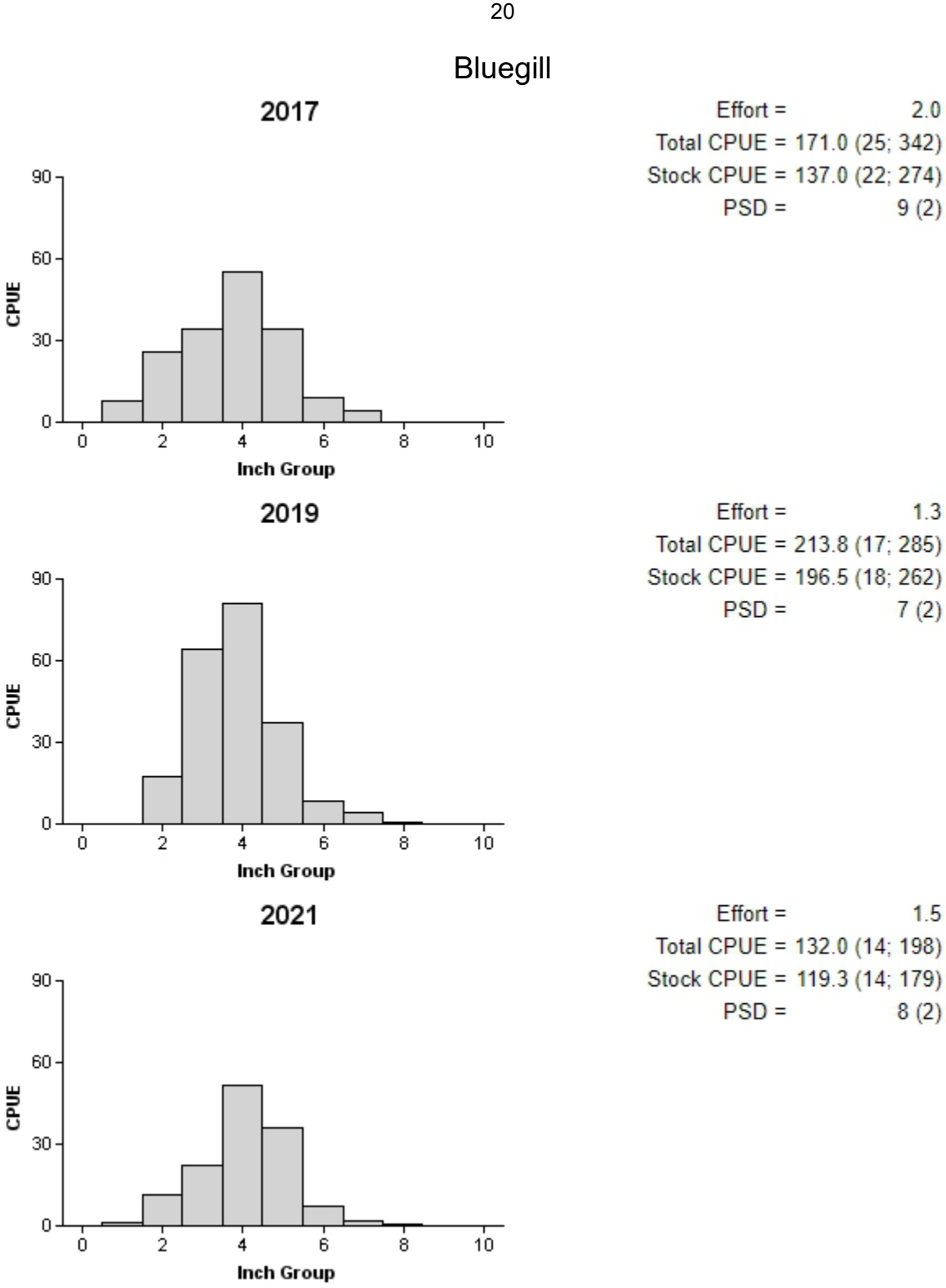


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Fork, Texas, 2017, 2019 and 2021.

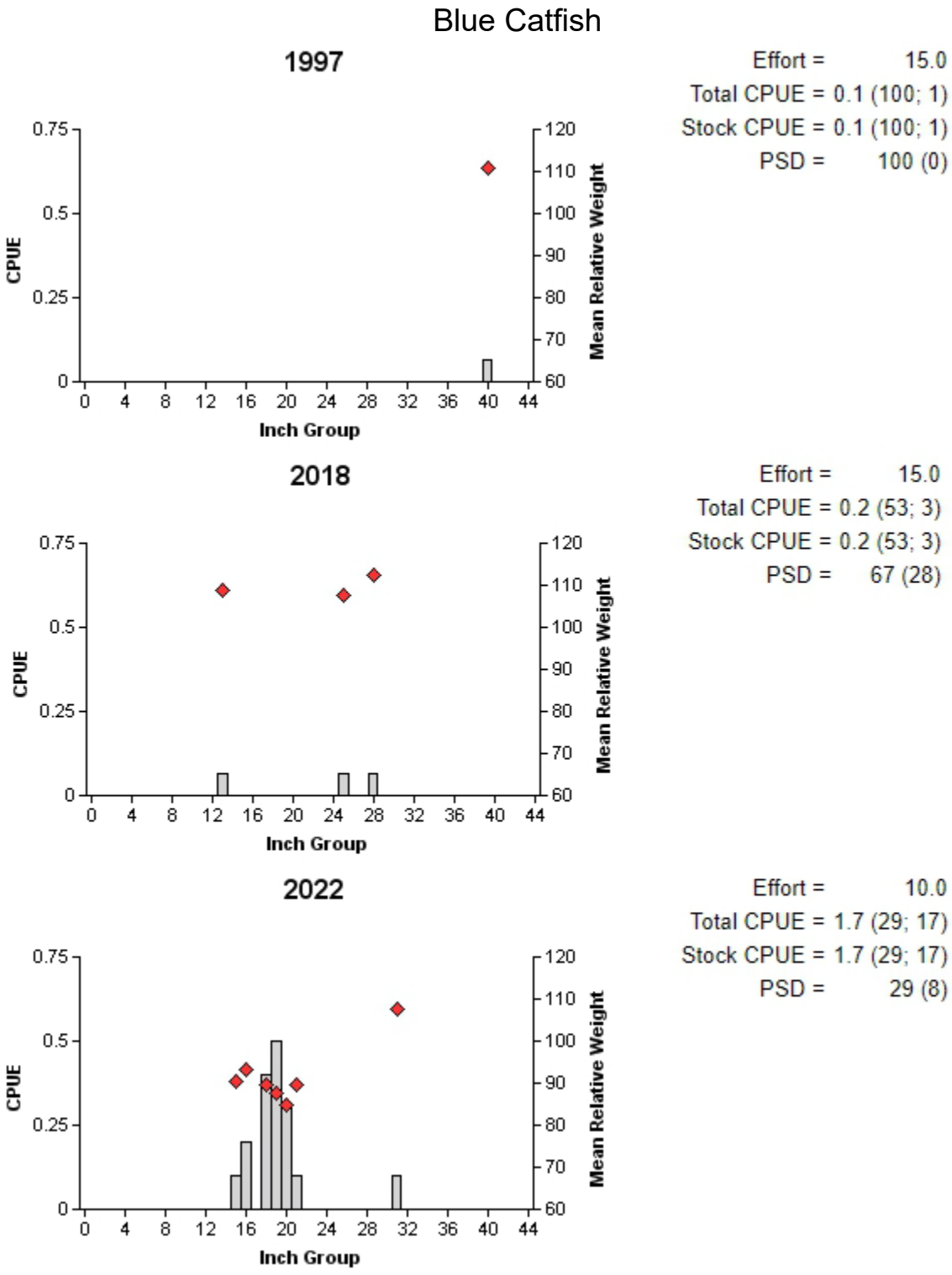


Figure 4. Number of Blue Catfish caught per net night (CPUE), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Fork, Texas, 1997, 2018 and 2022.

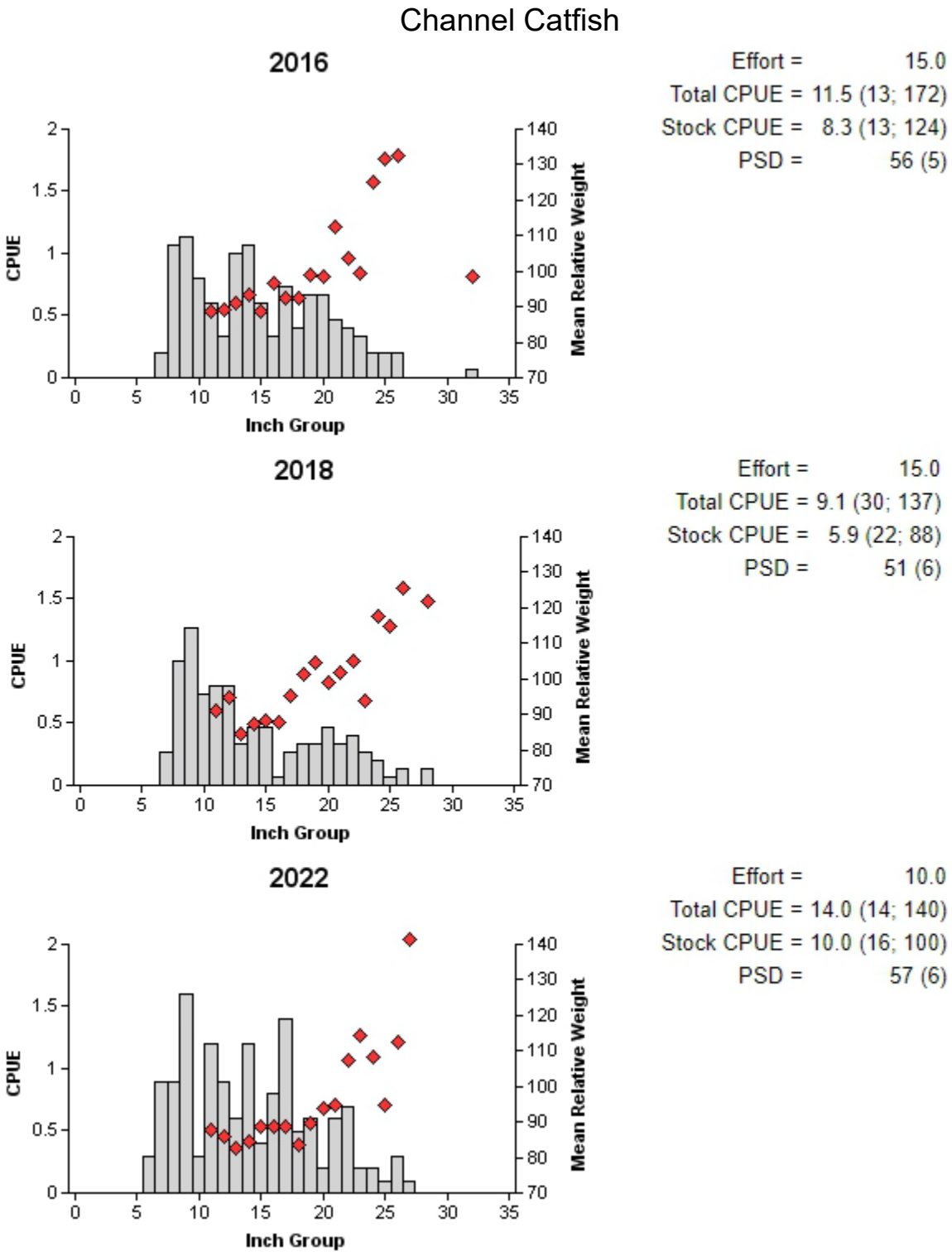


Figure 5. Number of Channel Catfish caught per net night (CPUE), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Fork, Texas, 2016, 2018 and 2022.

Catfish

Table 9. Creel survey statistics for Channel Catfish at Lake Fork, Texas, 2015 - 2021. Survey periods were June through May. Total catch per hour is for anglers targeting catfish and total harvest is the estimated number of catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2015/2016	2016/2017	2018/2019	2020/2021
Surface area (acres)	24,001	25,033	26,841	26,841
Directed angling effort (h)	78,168 (23)	36,175 (25)	35,236 (31)	91,690 (43)
Angling effort/acre	3.26 (23)	1.45 (25)	1.29 (31)	3.36 (43)
Total catch per hour	1.24 (34)	1.90 (32)	2.61 (20)	1.56 (59)
Total harvest	80,225 (50)	43,714 (45)	18,625 (73)	123,529 (34)
Harvest/acre	3.34 (50)	1.75 (45)	0.68 (73)	4.53 (34)
Percent legal released	29	17	25	4

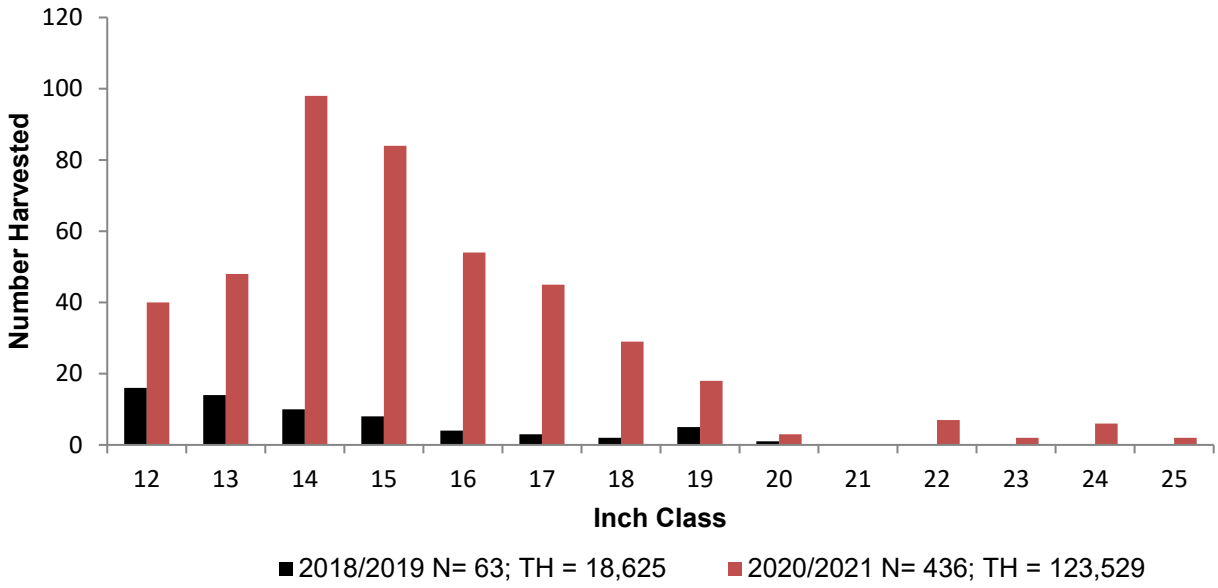


Figure 6. Length frequency of harvested Channel Catfish observed during creel surveys at Lake Fork, Texas, June through May, 2018/2019 and 2020/2021, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Figure 7. Length frequency of harvested Blue Catfish observed during creel surveys at Lake Fork, Texas, June through May 2020/2021, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

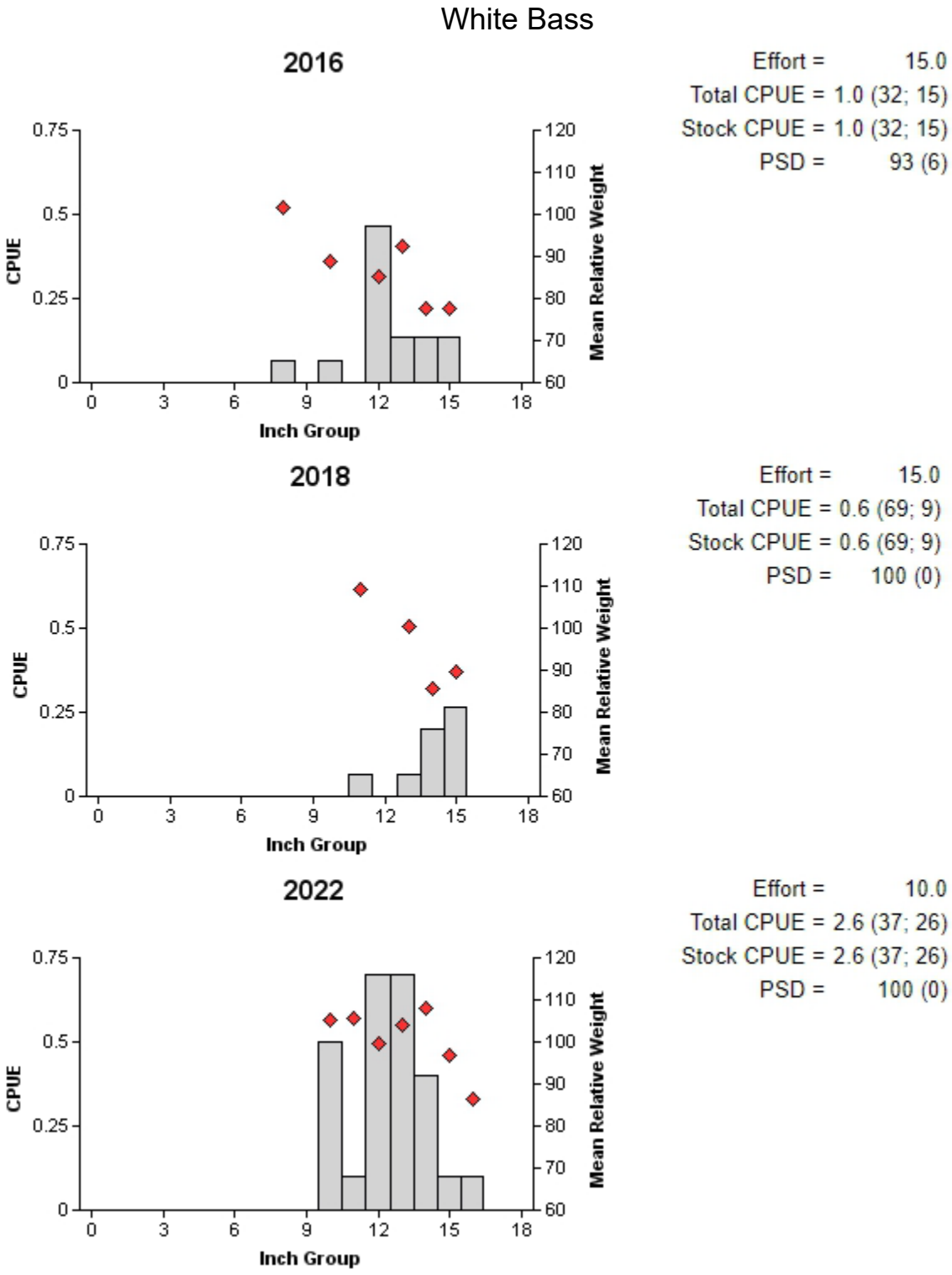


Figure 8. Number of White Bass caught per net night (CPUE), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Fork, Texas, 2016, 2018 and 2022.

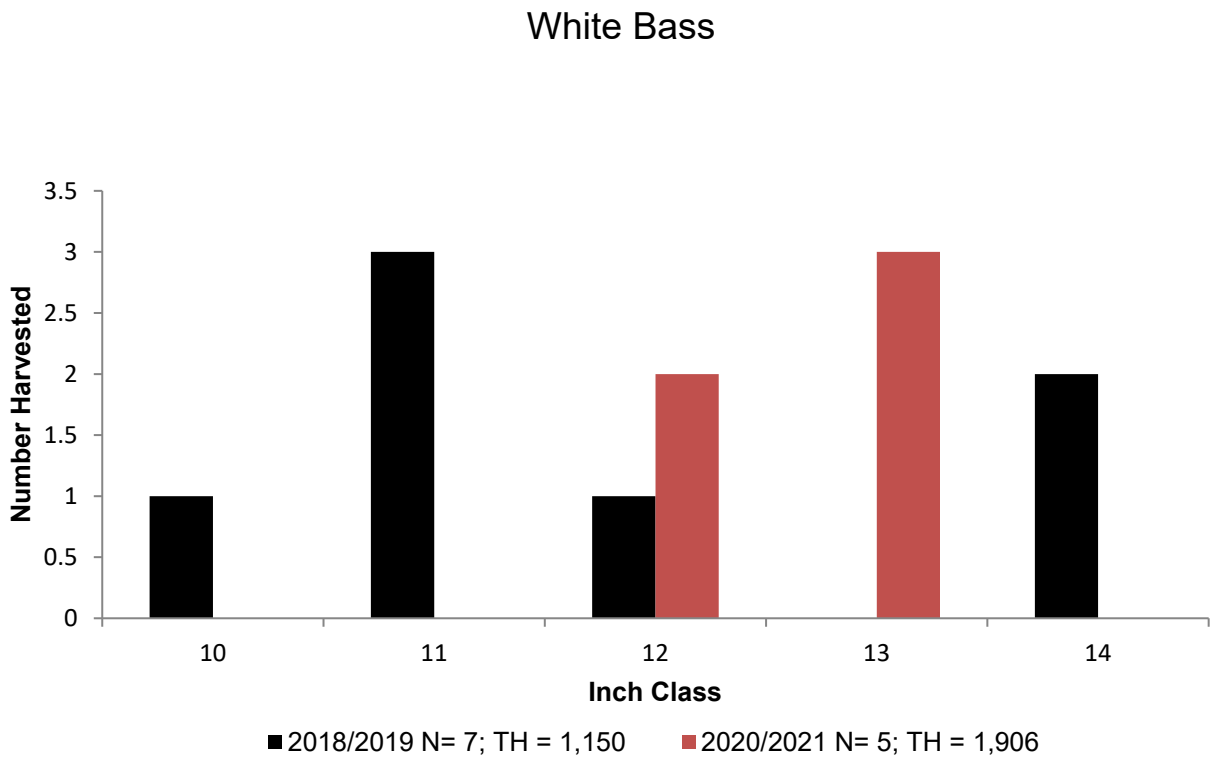


Figure 9. Length frequency of harvested White Bass observed during creel surveys at Lake Fork, Texas, June through May, 2018/2019 and 2020/2021, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

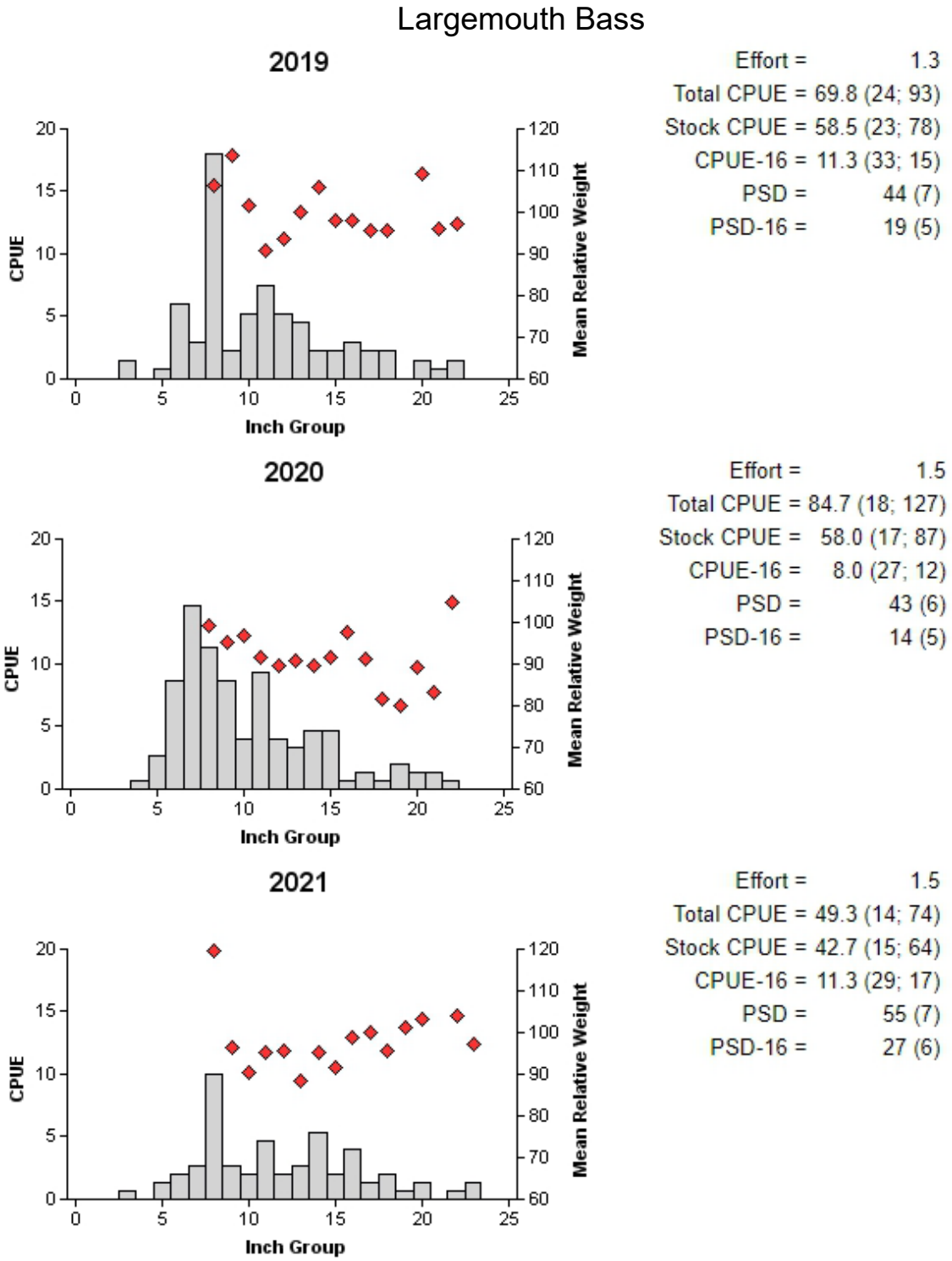


Figure 10. Number of Largemouth Bass caught per hour (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Fork, Texas, 2019, 2020 and 2021.

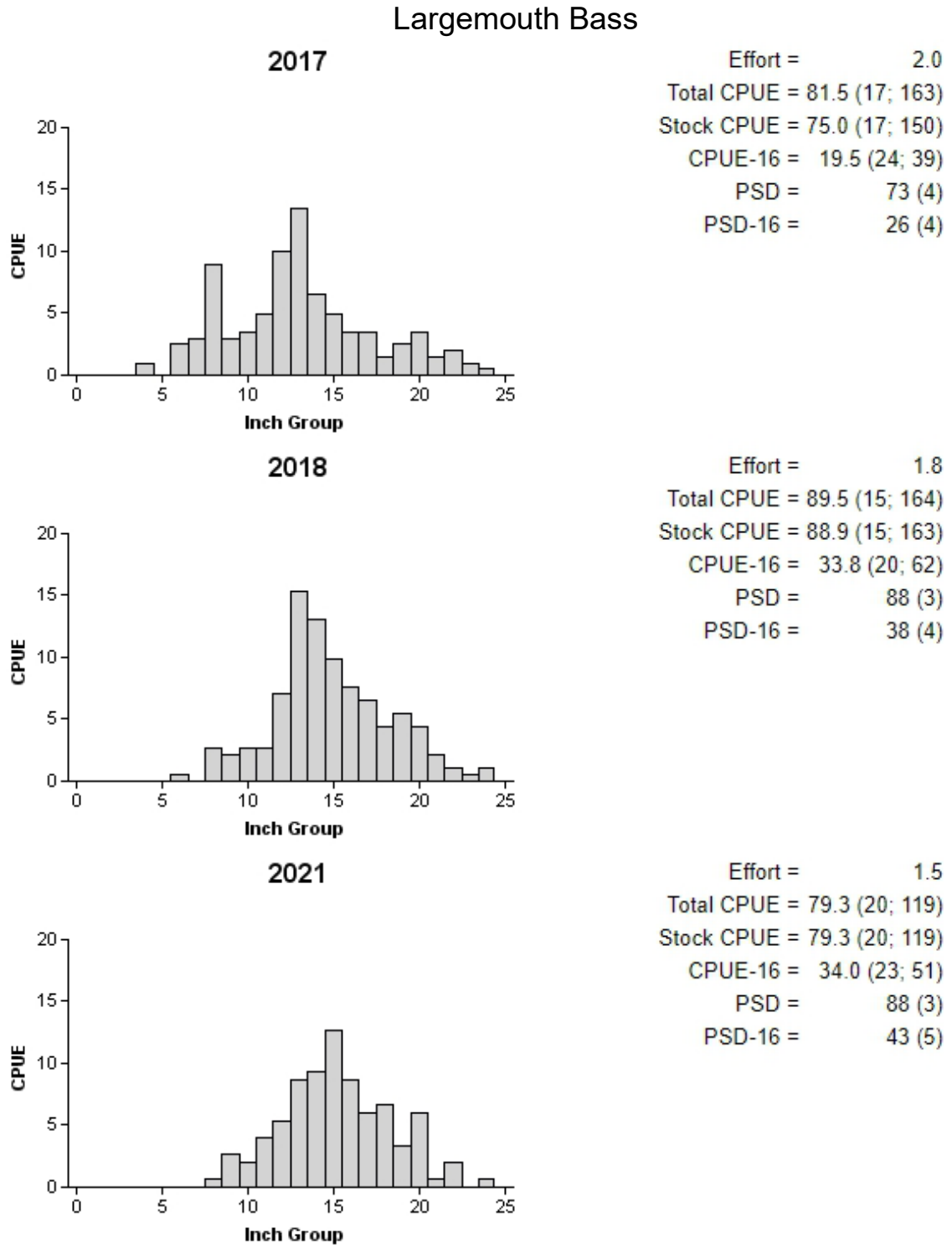


Figure 11. Number of Largemouth Bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Lake Fork, Texas, 2017, 2018 and 2021.

Table 10. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Fork, Texas. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB. Genetic composition was determined with micro-satellite DNA analysis.

		Number of fish						
Year	Sample size	FLMB	F1	Fx	Combined intergrades	NLMB	% FLMB alleles	% FLMB
2006	30	0	[a]	[a]	30	0	48.0	0.0
2007	30	0	[a]	[a]	30	0	53.4	0.0
2008	30	0	1	29	30	0	52.0	0.0
2009	30	0	0	30	30	0	48.0	0.0
2011	30	0	0	30	30	0	53.0	0.0
2013	30	2	2	26	28	0	57.0	6.7
2015	30	0	0	30	30	0	52.0	0.0
2021	30	0	1	29	30	0	48.0	0.0

[a]Analysis did not separate F1 from Fx hybrids

Table 11. Creel survey statistics for Largemouth Bass at Lake Fork, Texas, from 2015 through 2021. Survey periods were from June 1 through May 31. Catch rate is for all anglers targeting Largemouth Bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year			
	2015/2016	2016/2017	2018/2019	2020/2021
Surface area (acres)	24,001	25,033	26,841	26,841
Directed angling effort (h)				
Tournament	422,529 (26)	245,115 (17)	174,228 (32)	38,150 (61)
Non-tournament	346,411 (25)	227,699 (17)	219,379 (25)	464,792 (29)
All bass anglers combined	768,940 (21)	472,814 (16)	393,608 (28)	502,943 (31)
Angling effort/acre	32.04 (25)	18.89 (16)	14.44 (28)	18.4 (28)
Catch rate (number/h)	0.38 (13)	0.63 (13)	0.33 (14)	0.27 (23)
Harvest				
Non-tournament harvest	1,702 (107)	3,286 (61)	975 (83)	927 (173)
Tournament weigh-in and release	55,624 (59)	18,929 (45)	11,842 (48)	694 (509)
Harvest/acre	2.39 (57)	0.89 (47)	0.04 (83)	0.03 (173)
Release by weight				
<4.0 lbs	375,969 (42)	386,578 (36)	146,984 (43)	137,507 (74)
4.0-6.9 lbs	36,899 (56)	29,262 (45)	26,778 (48)	16,350 (76)
7.0-9.9 lbs	4,568 (94)	2,495 (117)	2,013 (96)	1,625 (111)
≥10.0 lbs	373 (114)	0	0	105 (102)
Percent legal released (non-tournament)	98	97	99	99

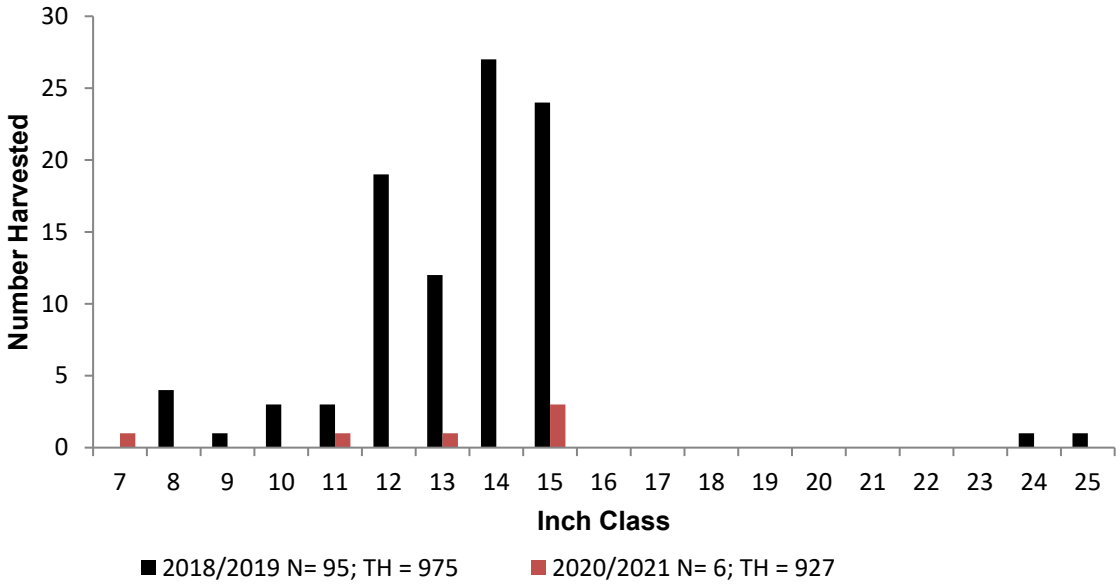


Figure 12. Length frequency of harvested Largemouth Bass observed during creel surveys at Lake Fork, Texas, June through May, 2018/2019 and 2020/2021, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Crappie

Table 12. Creel survey statistics for crappie at Lake Fork, Texas, from 2015 through 2021. Survey periods were from June 1 through May 31. Total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2015/2016	2016/2017	2018/2019	2020/2021
Surface area (acres)	24,001	25,033	26,841	26,841
Directed effort (h)	73,807 (24)	80,243 (22)	73,892 (23)	215,820 (28)
Directed effort/acre	2.51 (24)	3.21 (22)	2.71 (23)	7.92 (28)
Total catch per hour	1.63 (34)	1.18 (29)	1.31 (29)	1.32 (34)
Total harvest	96,994 (53)	70,910 (24)	22,197 (36)	220,112 (41)
White Crappie			15,790 (28)	125,924 (37)
Black Crappie			6,407 (55)	94,188 (46)
Harvest/acre	4.04 (53)	2.83 (53)	0.81 (36)	8.07 (41)
Percent legal released	5	12	10	6

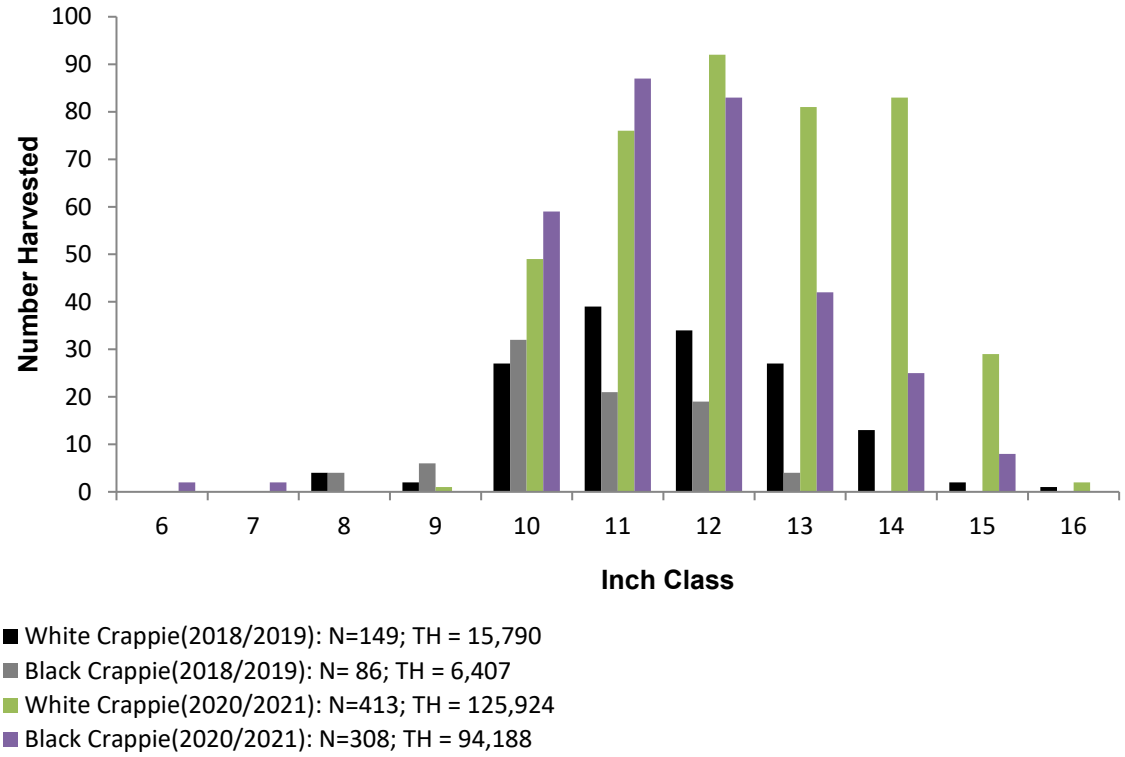


Figure 13. Length frequency of harvested White and Black Crappie observed during creel surveys at Lake Fork, Texas, June through May, 2018/2019 and 2020/2021, all anglers combined. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Proposed Sampling Schedule

Table 13. Proposed sampling schedule for Lake Fork, Texas. Survey period is June through May. Electrofishing surveys are conducted in the fall and spring.

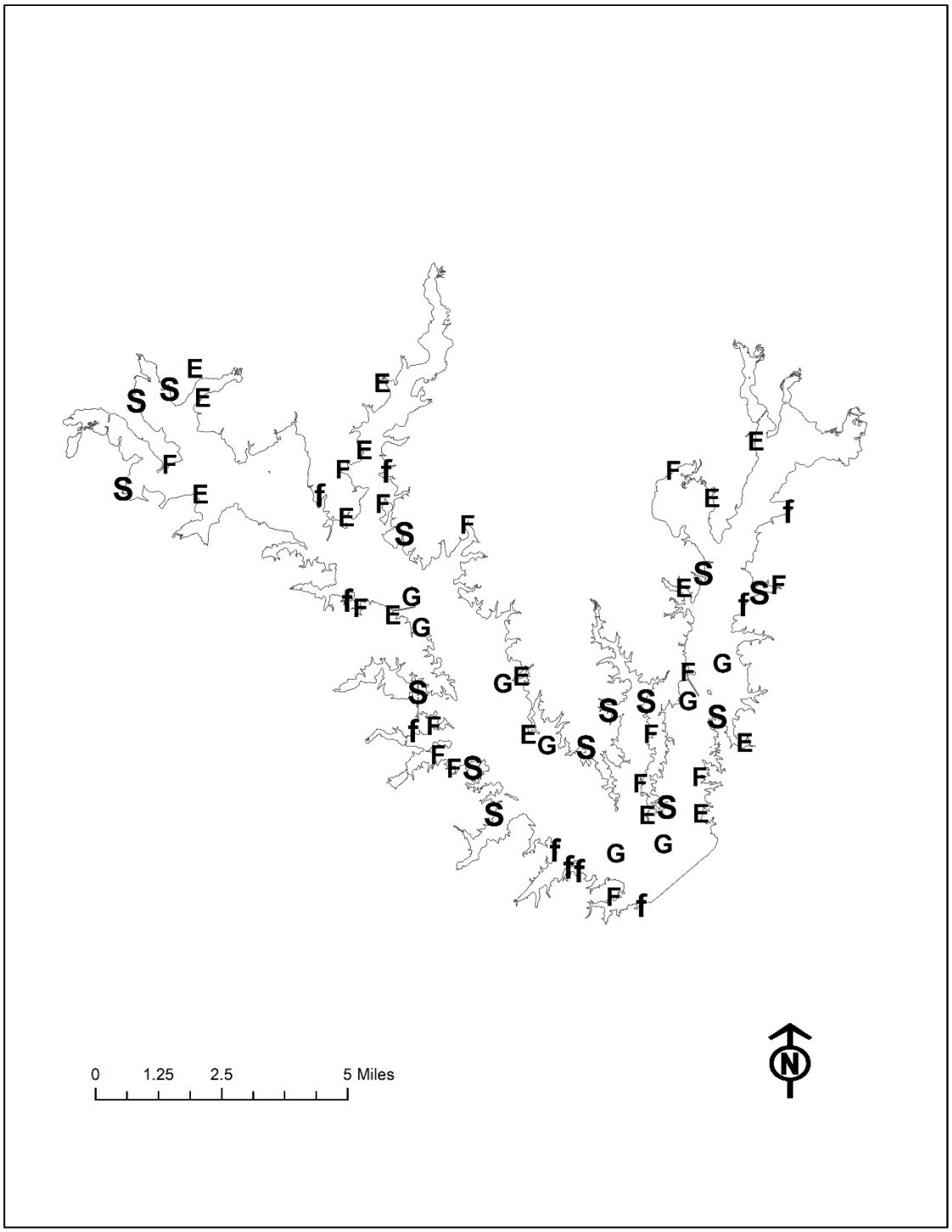
	Survey year			
	2022-2023	2023-2024	2024-2025	2025-2026
Angler access				x
Vegetation	x	x	x	x
Electrofishing - Fall		x		x
Electrofishing - Spring (bass only)		x		x
Gill netting				x
Creel survey	x		x	
Report				x

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 Fork, Texas, June 2021 – May 2022. Sampling effort was 10 net nights for gill netting and 1.5 hours for electrofishing.

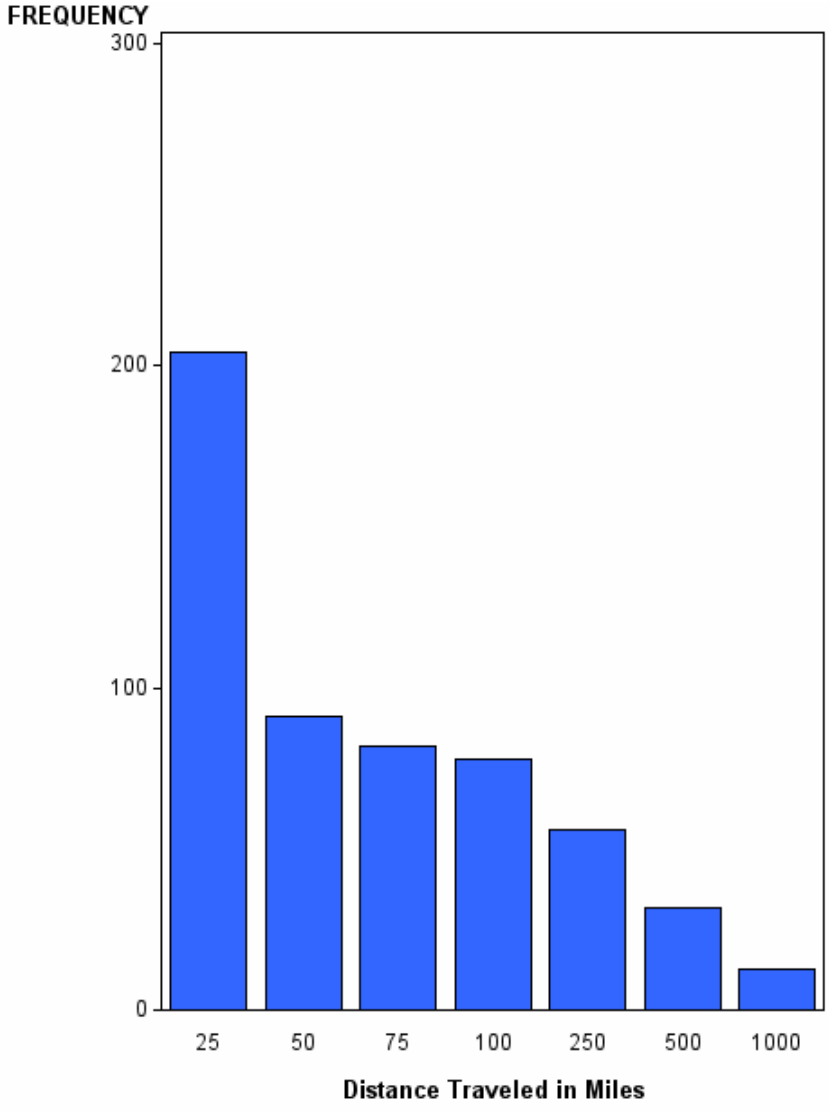
Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			347	231.3 (15)
Threadfin Shad			6,956	4637.3 (33)
Blue Catfish	17	1.7 (29)		
Channel Catfish	140	14.0 (14)		
White Bass	26	2.6 (37)		
Bluegill			198	132.0 (14)
Longear Sunfish			12	8.0 (30)
Redear Sunfish			64	42.7 (27)
Largemouth Bass			74	49.3 (14)

APPENDIX B – Map of sampling locations



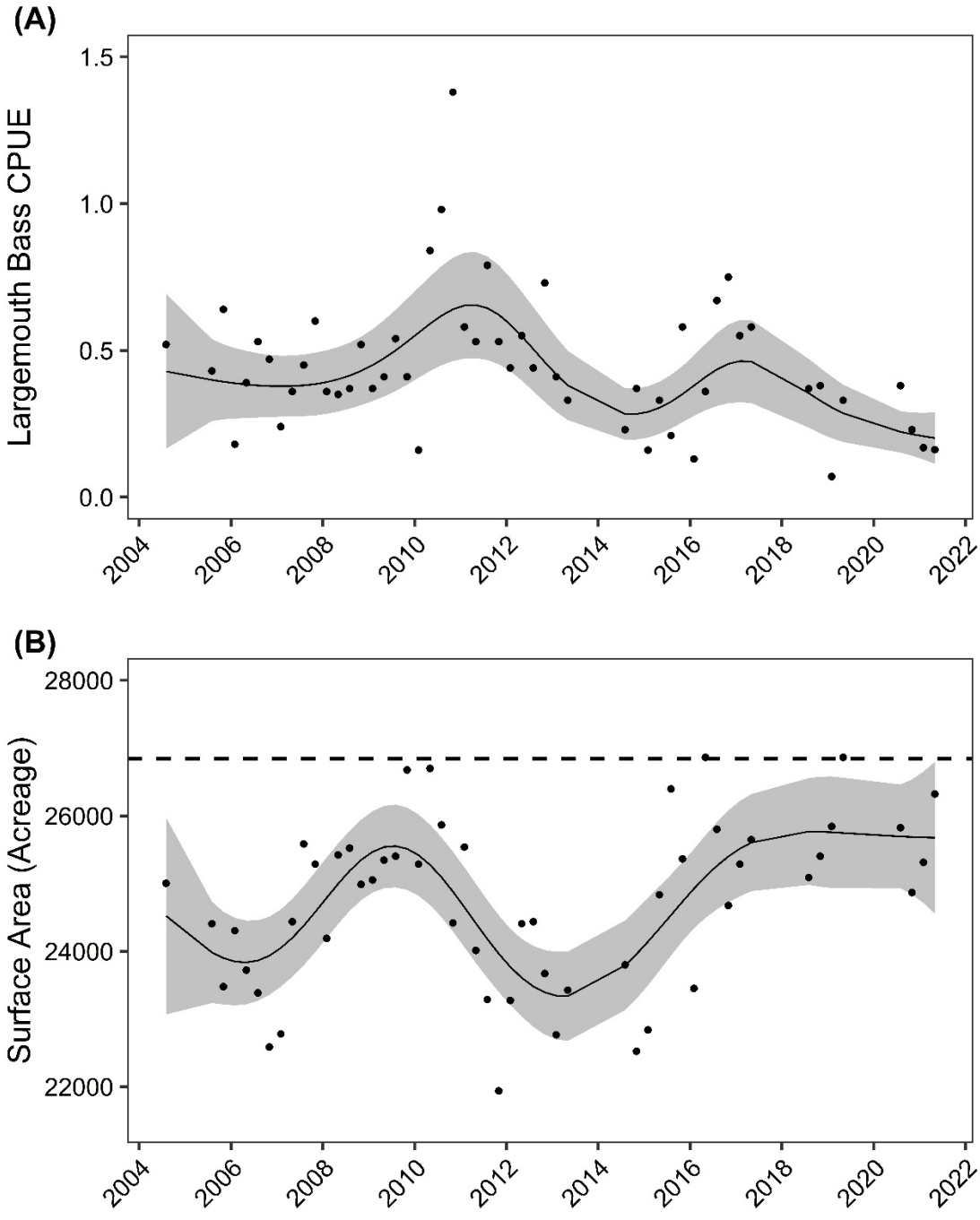
Location of sampling sites, Lake Fork, Texas, 2019-2022. Gill net, fall electrofishing and spring electrofishing stations are indicated by a G, E (fall 2019), F (fall 2020), f (fall 2021) and S (spring 2021). Water level was near full pool at time of sampling.

APPENDIX C – reporting of creel ZIP code data



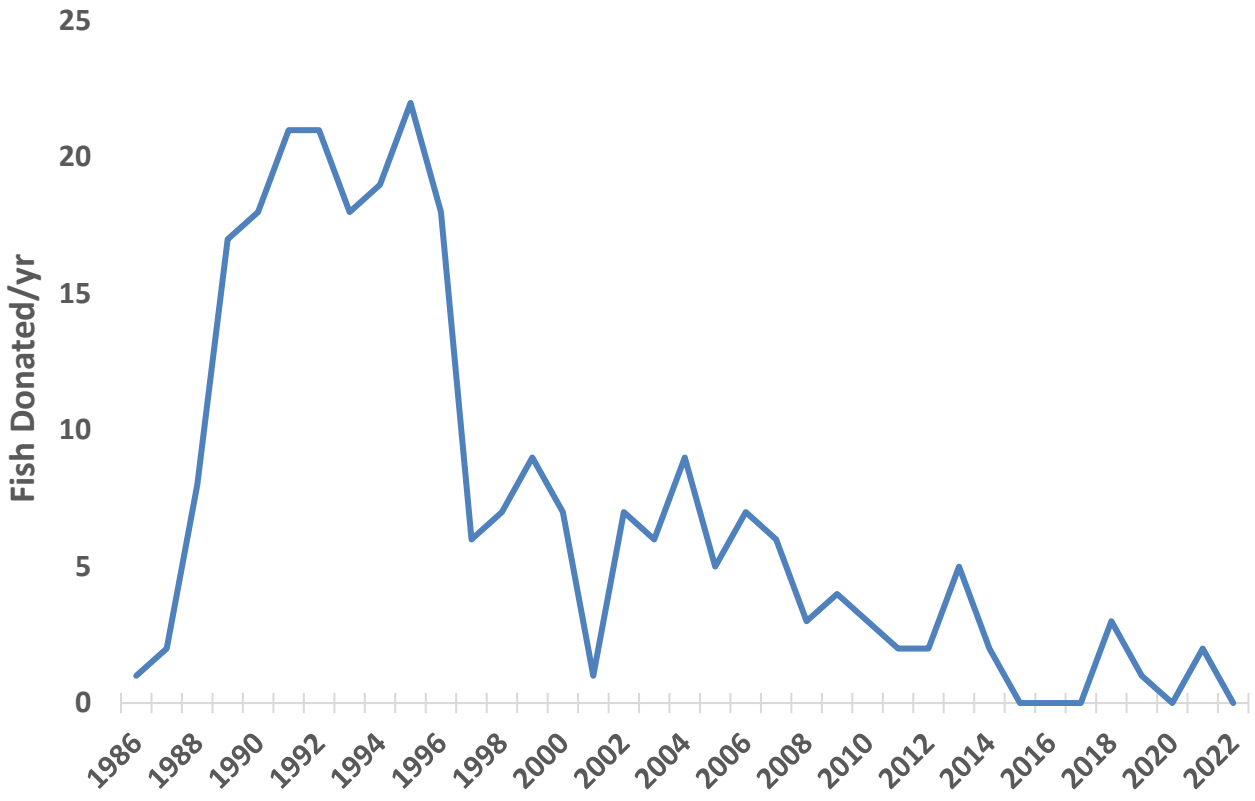
Frequency of anglers that traveled various distances (miles) to Lake Fork, Texas, as determined from the June 2020 through May 2021 creel survey.

APPENDIX D – Historic Creel Data: Largemouth Bass



Largemouth Bass angler catch rates within historic creel surveys and reservoir surface area fluctuations (2004–2021). Points indicate Largemouth Bass catch rates for anglers directly targeting the species during each creel quarter in panel (A). Points indicate the quarterly mean surface area (acreage) of Lake Fork in panel (B). Smooth estimates (solid black line) were predicted using a generalized additive model (GAM; Wood 2006) to depict the fluctuations in Largemouth Bass angler catch rates and reservoir surface area over time. The grey shaded portion of the smooth indicates the error of each smooth estimate in the 95% confidence interval. The dashed line in panel (B) indicates acreage at full pool (26,841 acres).

APPENDIX E – Historic Legacy ShareLunkers Caught



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