Medina Reservoir

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

Prepared by:

Mitchell Nisbet, Assistant District Management Supervisor
and
Randall Myers, District Management Supervisor

Inland Fisheries Division
San Antonio District, San Antonio, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

July 31, 2021

Contents

Survey and Management Summary

Fish populations in Medina Reservoir were surveyed in 2019 and 2021 using gill netting and in 2020 using electrofishing. Historical data are presented with the 2019-2021 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: Medina Reservoir is a 5,410-acre impoundment located on the Medina River in the San Antonio River Basin in Medina and Bandera counties, Texas. The reservoir experienced a considerable water level increase in 2015, filling to conservation pool elevation from 80 feet low. Subsequently, the reservoir water level dropped, then refilled again in late fall 2018. Since that time, the reservoir water level has dropped to approximately 36 feet low. Most of the shoreline is characterized as rock bluff or rocks and gravel. Flooded terrestrial vegetation is currently the predominant fisheries habitat type. In February 2021, zebra mussels were discovered in the reservoir, and since have established a population.

Management History: Important sport fish include Largemouth Bass, Hybrid Striped Bass, and White Bass. All species have been managed under statewide regulations. Florida Largemouth Bass fingerlings have been stocked most recently in 2016 when fisheries habitat was optimal for survival. Palmetto Bass have been stocked on an irregular basis due to variable availability and water level fluctuations and were most recently stocked in 2017 and 2018. Sunshine Bass were stocked in 2020. Texas Parks and Wildlife Department (TPWD) sent out a news release in March 2021 alerting constituents that zebra mussels were discovered in the reservoir and again in June 2021 that the lake was classified as infested.

Fish Community

- **Prey species:** Gizzard Shad and sunfish spp., primarily Bluegill, comprise the prey community. Threadfin Shad were present in the reservoir, in low relative abundance. Gizzard Shad relative abundance peaked and then declined following the refilling of the reservoir. Bluegill relative abundance has also decreased since 2016. In combination with declining water levels, prey species abundance could be a limiting factor contributing to reduced populations of some predator species.
- **Catfishes:** Both Blue and Channel Catfish relative abundance has remained consistently low. Population size structures for both catfish spp. likewise has remained consistent. Channel Catfish greater than 20 inches and Blue Catfish over 40 inches are available to anglers.
- **Temperate basses:** White Bass relative abundance was higher in 2019 and 2021 compared to previous years. Most fish collected in 2019 and all fish collected in 2021 exceeded 10-inches and were available for harvest. Hybrid Striped Bass relative abundance was greatly increased in 2021 and was the highest recorded for the lake. Hybrid Striped Bass up to 24 inches were available to harvest.
- **Largemouth Bass:** Relative abundance of Largemouth Bass in 2020 was similar to in 2016. Very few legal-length fish were available to anglers. Largemouth Bass had poor growth (average age at 14 inches long was 4.1 years) and were in poor condition (low relative weights).

Management Strategies: Continue to maintain and promote the Hybrid Striped Bass fishery by stocking 5-15 fish/acre when the water level is within 25 feet of conservation pool. Educate the public about the negative impacts of aquatic invasive species, monitor and record potential impacts of zebra mussels on sport fish in the reservoir, and install zebra mussel stencils on the public boat ramp and main private boat ramp. Conduct general monitoring surveys using gill nets and electrofishing in 2024-2025. Access and vegetation surveys will be conducted in 2024.

Introduction

This document is a summary of fisheries data collected from Medina Reservoir from 2019-2021. 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 2019-2021 data for comparison.

Reservoir Description

Medina Reservoir (5,410 acres) was constructed in 1913, is located on the Medina River in Medina and Bandera counties, Texas, and was built to support downstream agricultural irrigation needs. In 2000, the San Antonio Water System obtained rights to 19,974 acre-feet of released water for municipal use. The reservoir is characterized as deep, having an average depth of 46 feet, and relatively infertile with a secchi depth that exceeds 6 feet. Water level was 85 feet below conservation pool elevation (CP) in 2013 and 2014 before refilling in 2015 (Figure 1). The water level then fluctuated until 2019 when it began to decline to near 40 feet below CP. Most of the shoreline (75%) is characterized as rock bluff or rocks and gravel. Boat docks occur along 24% of the shoreline when the reservoir is near CP. The reservoir contained no aquatic vegetation in 2020. Other descriptive characteristics for Medina Reservoir are in Table 1.

Angler Access

Medina Reservoir has one public boat ramp, two larger private boat ramps and numerous smaller personal boat ramps adjacent to personal residences (Table 2). Many of the private ramps are open to public usage for a fee. The public ramp is located near the middle of the reservoir in Bandera County and both larger private ramps are near the dam. Bank-angling opportunity is very limited, occurring at only the public ramp. At the current water level, access is becoming an issue at the Bandera County ramp. There is still room to launch boats off the concrete ramp, but some anglers utilize a designated area to launch off the shoreline.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Myers 2016) included:

1. Stock Hybrid Striped Bass annually at 5-15 fish/acre when water level is within 25 feet of conservation pool elevation.

   Action: Palmetto Bass fingerlings were stocked in 2017 (N=55,608) and 2018 (N=55,393). Sunshine Bass fingerlings were stocked in 2020 (N=54,470).

2. Monitor for the presence of aquatic invasive species and cooperate with the controlling authority to inform users about such and measures to take to reduce risk of introductions.

   Action: A habitat/vegetation survey was conducted in August 2020, and no invasive aquatic plants were found. In February 2021 a member of the public submitted a report with a photo to TPWD of a zebra mussel located near one of the private boat ramps. TPWD staff along with the Bandera County River Authority and Groundwater District (BCRAGD) personnel conducted multiple searches. Zebra mussels were found both near the initial reported location and attached to a BCRAGD settlement sampler 3 miles upstream. A news release sent out by TPWD classified the lake as positive in March 2021 and was classified as infested in June 2021. “Clean, Drain, and Dry” signage remains posted at the public boat ramp and zebra mussel information stencils will be placed on the public ramp and one of the larger private ramps.

Harvest regulation history: All species have always been managed with statewide regulations. Current regulations are found in Table 3.

Stocking history: Stockings of Palmetto Bass and Florida Largemouth Bass (FLMB) have been sporadic during the last two decades, due primarily to periods of extreme low water. Palmetto Bass, FLMB, and Blue Catfish were stocked following reservoir refill in 2015 and Palmetto Bass were also stocked annually between 2016 and 2018. Sunshine Bass were stocked in 2020. The complete stocking history is in Table 4.

Vegetation/habitat management history: No vegetation or habitat management activities have occurred on this reservoir.

Water transfer: No inter-basin 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 Medina Reservoir (Myers 2016). 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 nighttime electrofishing (1.5 hours at 18, 5-min stations). Less electrofishing effort was used in 2015 (0.8 h at 9, 5-minute stations) due to the high and consistent numbers of fish collected which yielded sufficient estimate precision. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. All 13.0-14.9 inch Largemouth Bass (N = 12) were collected and aged to determine average age at 14 inches total length (TL).

Gill netting – Channel Catfish, Blue Catfish, White Bass, and Hybrid Striped Bass were collected by gill netting (10 net nights at 10 stations). Gill netting CPUE was recorded as the number of fish caught per net night (fish/nn). Ages for Hybrid Striped Bass were determined using otoliths from 13 randomly selected fish between 17.0 and 18.9 inches.

Genetics – Genetic analysis of black basses 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 condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Hybrid Striped Bass PSD was calculated according to Dumont and Neely (2011). 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 habitat/vegetation survey was conducted in 2020 using the random point sampling method according to the Fishery Assessment Procedures (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: Declining water levels (Figure 1) have reduced available habitat in the reservoir. Flooded terrestrial vegetation was the primary habitat type and was present in 6% of the reservoir in 2020 (Table 6). A shoreline structural survey was not conducted as there has not been significant shoreline modifications since 2005 when such was completed by Myers and Dennis (2004).

Prey species: Electrofishing CPUE and IOV of Gizzard Shad increased to 71.3/h and 71, respectively, indicating that proportionally more fish were sufficiently sized as prey for predators compared to 2016 (Figure 2). Gizzard Shad populations declined greatly in 2016, the current rebound of Gizzard Shad, coincides with a decline in Largemouth Bass abundance. Bluegill CPUE was 302.0/h in 2016 and has fallen to 64.0/h in 2020 (Figure 3). The majority of the Bluegill population in 2020 was comprised of fish $\leq$4 inches TL, an ideal prey size for Largemouth Bass. Electrofishing CPUE of Threadfin Shad was low in 2020 (2.0/h; Appendix A).

Blue Catfish: The gill net catch rate of Blue Catfish was similar since 2017 (Figure 4) with a CPUE of 1.0/nn in 2019 and 1.1/nn in 2021, which was similar to the CPUE in 2017 (1.5/nn). All captured fish were stock size or greater. Population size structure was also consistent (PSD=60 in 2019 and PSD=73 in 2021) compared to the previous survey period (PSD=83 in 2017). Blue Catfish W_r has continued to improve following the 2015 reservoir refill, especially for larger fish, where fish greater than 25 inches had $W_r > 100$. Whereas in the previous survey period, larger fish had $W_r \leq 90$. Fish greater than 40 inches were available to anglers, this had not been seen in the previous survey period.

Channel Catfish: Gill net CPUE of Channel Catfish remained low in the reservoir in both 2019 and 2021 (1.2/nn; Figure 5). Proportional size distribution values ranged from 11 in 2019 to a high of 36 in 2021, indicating few fish exceeded quality size.

White Bass: The gill net CPUE has been variable (Figure 6). Gill net CPUE of White Bass was lower in 2021 (2.6/nn) compared to 2019 (4.2/nn), although both of these were greater than in 2017 (1.4 /nn). The majority of fish captured in 2019 and all fish captured in 2021 exceeded the minimum size limit ($\geq$10 inches total length) with all fish exhibiting good condition ($W_r \geq 90$).

Hybrid Striped Bass: The gill net CPUE of Hybrid Striped Bass was 1.1/nn in 2019, down from 1.5/nn in 2017, but increased substantially in 2021 (9.7/nn; Figure 7). Proportional size distribution in 2019 and 2021 was similar to the previous survey period (79-87). All but one fish captured in this survey period was stock length or greater, with fish up to 23-inches available to anglers. In both 2019 and 2021 W_r declined with fish size and was poor ($W_r \leq 85$) for fish over 20 inches. This could be due to intraspecies competition associated with declining prey population abundance. It took between 2-4 years for fish to reach legal length. Average age of 17.0-18.9-inch Hybrid Striped Bass (N=13 fish) was 3.4 years in 2021. Per the OBS objectives from the previous report (Myers 2016), the target number of fish collected to accommodate size structure and growth analyses was 25 and all fish were aged. In 2109, while conducting a survey with UTSA students only 11 fish were collected. Thus, in 2021, we altered our OBS objectives to match previous survey period age and growth metrics, where 13 random fish between 17.0 and 18.9 inches were aged to estimate length of time to reach legal length.

Black basses: Electrofishing CPUE of Largemouth Bass has continued to decline since 2015 (340 fish/h). In 2020, Largemouth Bass CPUE-total was 88.7/h and CPUE-stock was 57.3/h (Figure 8). Size structure has increased from the previous survey period but is still not adequate (PSD=33 in 2020). Very few legal length fish (14 inches) were available to anglers in the reservoir. In 2020, Largemouth Bass condition declined as fish length increased, suggesting forage could be limiting the number of quality sized Largemouth Bass in the population. Largemouth Bass growth is typically slow to moderate at this reservoir. It took between 3-5 years for fish to reach legal size, and average age of 13.0-14.9-inch fish (N=12 fish) was 4.1 years. This was unfortunately one fish shy of our OBS objectives. Genetic introgression of Florida Largemouth Bass into the population in 2020 (70% FLMB alleles) was higher than in previous years, with 10% of sampled fish identified as non-intergrade FLMB genotype, which was fewer than in previous years (Table 7). The 2020 electrofishing survey documented Guadalupe Bass for

the first time in the reservoir, in low relative abundance (2.0/h; Appendix A). These fish had their genetics analyzed, one returned as a non-intergrade Guadalupe Bass genotype. The two intergrade Guadalupe Bass were hybridized with unknown micropterids.

Fisheries Management Plan for Medina Reservoir, Texas

Prepared – July 2021

ISSUE 1: Hybrid Striped Bass have been a popular game fish in Medina Reservoir since their first introduction. Stocking is required to sustain the population and maintain a fishery. However, low water level in some years negatively affects survival of stocked fish.

MANAGEMENT STRATEGY

1. Stock Hybrid Striped Bass annually at 5-15 fish/acre when water level is within 25 feet of conservation pool elevation.

ISSUE 2: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. The reservoir was classified as positive for zebra mussels through a news release in March 2021. 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 (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with Bexar Medina Atascosa Water Control and Improvement District No. 1, Bandera County River Authority and Groundwater District, and private marina owners to post appropriate signage at access points and zebra mussel stencils on boat ramps 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

Important sport fishes in Medina Reservoir include Largemouth Bass, Hybrid Striped Bass, and White Bass. Channel Catfish and Blue Catfish are also present and contribute to the fishery. Known important forage species include Bluegill and Gizzard Shad. Sampling schedule is in Table 8.

Low-density fisheries
Black and White Crappies: Historically (2003-2004), only 5% of the angling effort on the reservoir was expended targeting crappies (Myers and Dennis 2004). No targeted sampling (i.e. trap nets) will be conducted for these species.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are the most highly sought-after sport fish in the reservoir, historically (Myers and Dennis 2004), they accounted for 43% of total angling effort. Since 2000, electrofishing sampling has been conducted every fourth year, typically at 18 random stations. In 2015 however, fewer stations were sampled, as there were high and consistent number of fish collected which yielded sufficient estimate precision. Existing data shows that the current sampling protocol is sufficient for evaluating for large scale changes in population abundance and will provide adequate sampling precision in most years (RSE≤25). This remains our primary sampling objective for Largemouth Bass. Fall night time electrofishing surveys will continue once every four years, with the next being conducted in 2024. The fall survey will consist of 18 randomly selected 5-minute stations. Because this species accounts for the most angling effort on the reservoir and harvest regulation changes are often used to manage this species, size structure and growth information are important. As such, a minimum target of 50 stock-size fish will be used to accommodate a reliable size structure analysis (i.e. PSD). Lengths and weights will be measured from a target of 5 fish per represented inch group > stock length to calculate mean relative weights and assess body conditions. Specifically, for growth, 13 fish ranging in size from 13.0-14.9 inches will be aged to determine average years to attain 14 inches in length. This number of fish will result in adequate inference about the presence of legal harvestable length fish, and the number of years necessary to attain such length. No additional electrofishing sampling effort will be used in the event RSE exceeds 25 for CPUE. If sample size objectives are not achieved, then up to 0.5 hours of additional electrofishing may be conducted to improve sample size.

Hybrid Striped Bass: The objective for Hybrid Striped Bass is to determine large-scale changes in relative abundance, general success of stockings, and population size structure. Gill net sampling of 10 net-nights has provided estimates of precision (RSE ≤50) in most years. In previous study periods, sampling effort of 40-50 net-nights would be needed to achieve a Hybrid Striped Bass CPUE estimate having a RSE ≤25, 80% of the time. Sampling success for Hybrid Striped Bass is in part a function of stocking density and frequency as this species is not self-sustaining. Hybrid Striped Bass were stocked during years when water level was conducive for such. Stockings occurred about every other year prior to 2012. Extreme low water level (>50 ft. low) from 2012 to spring 2015 precluded stocking. Water level returned to near full pool in 2015, and Palmetto Bass fingerlings were stocked each year from 2016 to 2018 and Sunshine Bass were stocked in 2020. In 2019 an additional gill net survey was conducted in with the help of students from University of Texas – San Antonio. The standard 10 net-night sample collected in 2021 yielded record catches (N=90). Instead of aging all fish, 13 randomly selected fish between 17.0-18.9 inches were aged to determine average years to attain 18 inches in length. This growth estimate aligns with data collected in previous survey periods and will be the growth objective moving forward. A minimum target of 25 fish will be used to accommodate size structure analysis. Lengths and weights will be measured from a target of 5 fish per represented inch group > stock length to calculate mean relative weights and assess body conditions. Gill net sampling will occur once every four years using 10 net-nights of effort at random stations. No additional gill net sampling effort will be used in

the event RSE exceeds 25 for CPUE and less than 25 Hybrid Striped Bass are collected. The next sampling event will be in spring 2025.

White Bass: The objective for White Bass is to determine large-scale changes in relative abundance and size structure. Sampling will be accomplished using gill nets at 10 randomly selected stations. Precision estimates were not met in either 2019 or the 2021 sampling years. Sampling effort of 40+ net-nights would be needed to achieve a White Bass CPUE estimate having a RSE $\leq$25, 80% of the time. As such, no fish sample size or precision targets are set. The next sampling event will occur in spring 2025.

Blue and Channel Catfish: The low-density nature of these populations and highly dynamic water level fluctuations (up to 50 ft. annually) makes it difficult to consistently achieve precise CPUE estimates (RSE $\leq$25). Sampling effort of 20-40 net-nights would be needed to achieve 80% of the time, a Channel Catfish CPUE estimate with an RSE $\leq$25. Nevertheless, existing data show that the current sampling protocol is sufficient for evaluating for large-scale changes in population abundance and will provide sufficient estimate precision (RSE $\leq$50) in most years. This remains our primary sampling objective for catfishes. Designation of specific sampling objectives for size structure and growth metrics for these species is currently unnecessary due to the low-density nature of these populations. Gill net sampling will occur once every four years using 10 net-nights of effort at random stations. No additional gill net sampling effort will be used in the event RSE exceeds 50 for CPUE. The next sampling event will be in spring 2025.

Gizzard Shad and Bluegill: Bluegill and Gizzard Shad are the primary forage species at Medina Reservoir. Concurrent sampling with Largemouth Bass across 18 stations typically provided adequate inference and precision for detecting large-scale changes in these populations (RSE $\leq$50). Sampling of these species will continue to be conducted at 18 random sites at night during fall. No additional effort will be expended to increase the number of Bluegill or Gizzard Shad collected or reduce RSEs. Sampling will occur once every four years and the next sample will be fall 2024.

Literature Cited

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Dumont, S. C., and B. C. Neely. 2011. A proposed change to Palmetto Bass proportional size distribution length categories. North American Journal of Fisheries Management 31: 722-725.

Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7): 348.

Myers, R. and J. Dennis. 2004. Statewide freshwater fisheries monitoring and management program survey report for: Medina Reservoir, 2004. Texas Parks and Wildlife Department, Federal Aid In Sport Fish Restoration, Grant F-30-R, Performance Report, Austin.

Myers, R. 2016. Statewide freshwater fisheries monitoring and management program survey report for: Medina Reservoir, 2016. Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Grant F-221-M-3, Performance Report, Austin.

United States Geological Society (USGS). 2021. National water information system: Web interface. Available: http://waterdata.usgs.gov/tx/nwis (April 2021).

Tables and Figures

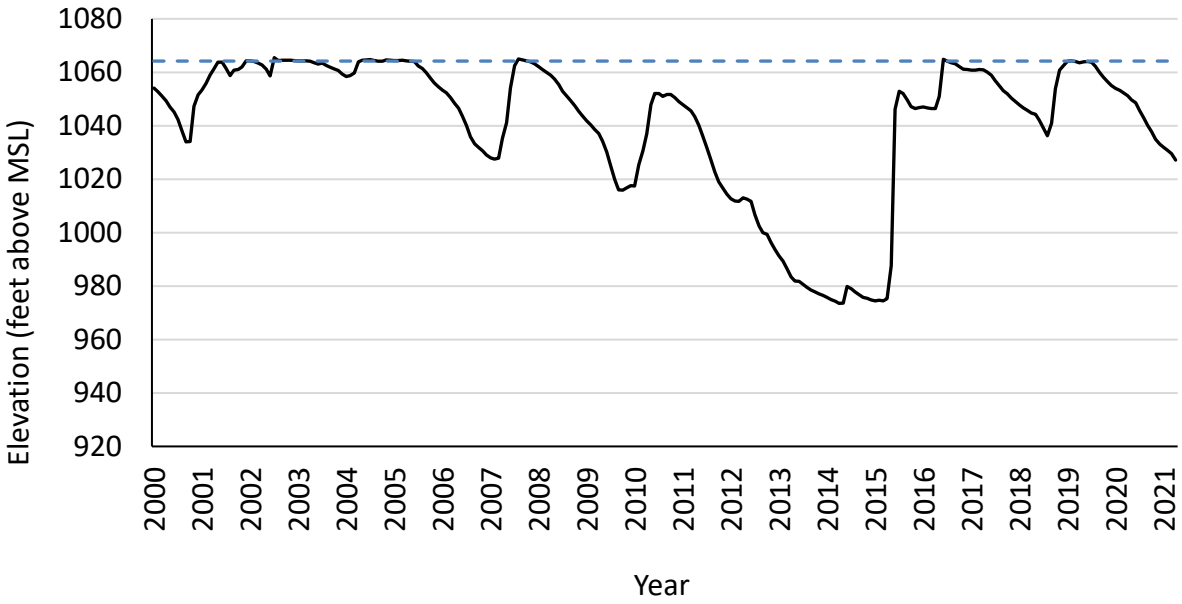


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Medina Reservoir, Texas. Conservation level (dashed blue line) is 1,064.2 feet above MSL.

Table 1. Characteristics of Medina Reservoir, Texas.

Characteristic	Description
Year constructed	1913
Controlling authority	Bexar Medina Atascosa Counties Water Improvement District No. 1 and Bandera County River Authority and Groundwater District
County	Medina and Bandera
Reservoir type	Mainstream
Shoreline Development Index	10.5
Conductivity	388 µS/cm

Table 2. Boat ramp characteristics for Medina Reservoir, Texas, August 2020. Reservoir elevation at time of survey was 1,042.9 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Bandera County Park	29.56438 -98.95469	Y	20	unknown	2-lane concrete, good
Red's Cove	29.54719 -98.92740	N	30	unknown	2-lane concrete, good
Joe's Marina	29.542762 -98.929256	N	15	unknown	1-lane concrete, good

Table 3. Harvest regulations for Medina Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Hybrid Striped	5	18-inch minimum
Bass, Largemouth	5[a]	14-inch minimum
Bass, Guadalupe	5[a]	None
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

[a] Daily bag for Largemouth Bass, Spotted Bass, and Guadalupe Bass = 5 fish in any combination.

Table 4. Stocking history of Medina Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults NR = not recorded.

Species	Year	Number stocked	Size
Blue Catfish	1974	186,750	NR
	1975	3,000	NR
	2015	66,528	FGL
	Total	256,278	
Channel Catfish	1967	2,750	NR
	2007	185,271	FGL
	Total	188,021	
Florida Largemouth Bass	1976	65,000	FGL
	1977	59,950	FRY
	1978	99,901	FGL
	2003	276,179	FGL
	2005	271,158	FGL
	2015	203,768	FGL
	Total	975,956	
Largemouth Bass	1967	7,500	NR
	1971	70,000	NR
	Total	77,500	
Palmetto Bass	1977	60,400	NR
	1979	59,968	NR
	1983	55,450	NR
	1994	61,300	FGL
	1995	92,700	FGL
	1996	85,900	FGL
	1997	83,971	FGL
	1998	56,304	FGL
Palmetto Bass *continued*	1999	41,897	FGL
	2000	5,550	FGL
	2002	42,146	FGL
	2004	42,281	FGL
	2005	81,265	FGL
	2007	23,859	FGL
	2008	54,586	FGL
	2011	28,180	FGL
	2016	46,662	FGL
	2017	55,608	FGL
	2018	55,393	FGL
	Total	1,033,420	
Smallmouth Bass	1977	60,850	NR
	1979	51,725	NR
	1987	22,630	FGL
	1988	78	ADL
	1988	106,594	FRY
	Total	241,877	
Sunshine Bass	2020	54,470	FGL
	Total	54,470	FGL
Walleye	1973	640,000	NR
	1974	134,750	NR
	Total	774,750	NR
Warmouth	1967	47,000	NR
	Total	47,000	NR

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

Gear/target species	Survey objective	Metrics	Sampling objective
Gill netting			
Hybrid Striped Bass [a]	Relative abundance	CPUE	RSE≤50
	Size structure	PSD, length frequency	N ≥ 25
	Year class presence	Age	N ≥ 25
	Age and growth	Mean length at age	N ≥ 25
	Condition	W_r	10 fish/inch group (max)
White Bass	Relative abundance	CPUE	RSE≤50
	Size structure	PSD, length frequency	none
	Year class presence	Age	none
	Age and growth	Mean length at age	none
	Condition	W_r	10 fish/inch group (max)
Blue Catfish	Relative abundance	CPUE	RSE≤50
	Size structure	PSD, length frequency	none
	Condition	W_r	10 fish/inch group (max)
Channel Catfish	Relative abundance	CPUE	RSE≤50
	Size structure	PSD, length frequency	none
	Condition	W_r	10 fish/inch group (max)
Electrofishing			
Largemouth Bass [b]	Relative abundance	CPUE	RSE≤25
	Size structure	PSD, length frequency	N (stock) ≥ 30
	Age and growth	Mean age at 14”	N ≥ 13
	Condition	W_r	10 fish/inch group (max)
Bluegill [c]	Relative abundance	CPUE	RSE≤50
	Size structure	Length frequency	none
Gizzard Shad [c]	Relative abundance	CPUE	RSE≤50
	Size structure	IOV, length frequency	none

[a] No additional effort beyond the 10 gill nets will be expended in the event fewer than 25 Hybrid Striped Bass are collected.

[b] No additional effort beyond 18 5-minute nighttime electrofishing stations will be expended to collect 30 stock sized Largemouth Bass or 13 Largemouth Bass between 13.0 and 14.9 inches.

[c] No additional effort will be expended to achieve an RSE ≤ 50 for CPUE of Bluegill and Gizzard Shad if not reached from designated electrofishing sampling effort. Instead, growth and body condition of other sport fishes can provide information on forage abundance and vulnerability.

Table 6. Results of random point sampling vegetation surveys conducted at Medina Reservoir in September of 2016 and August 2020. Percent occurrence is shown for predominate habitat types along with lower and upper 95% confidence interval (in parentheses). N/A describes instances where the habitat type was not recorded or observed. Reservoir elevation (in feet) relative to conservation pool elevation (1,064.2 feet above mean sea level) and number of random points sampled are provided for reference.

Habitat type/survey metric	2016	2020
Open water	53 (44-62)	92 (85-66)
Flooded terrestrial vegetation	46 (37-55)	6 (3-13)
Standing Timber	1 (0-4)	N/A
Boat Docks	N/A	2 (0-6)
Relative reservoir elevation (ft. above MSL)	-1	-22
Number of random points	124	109

Gizzard Shad

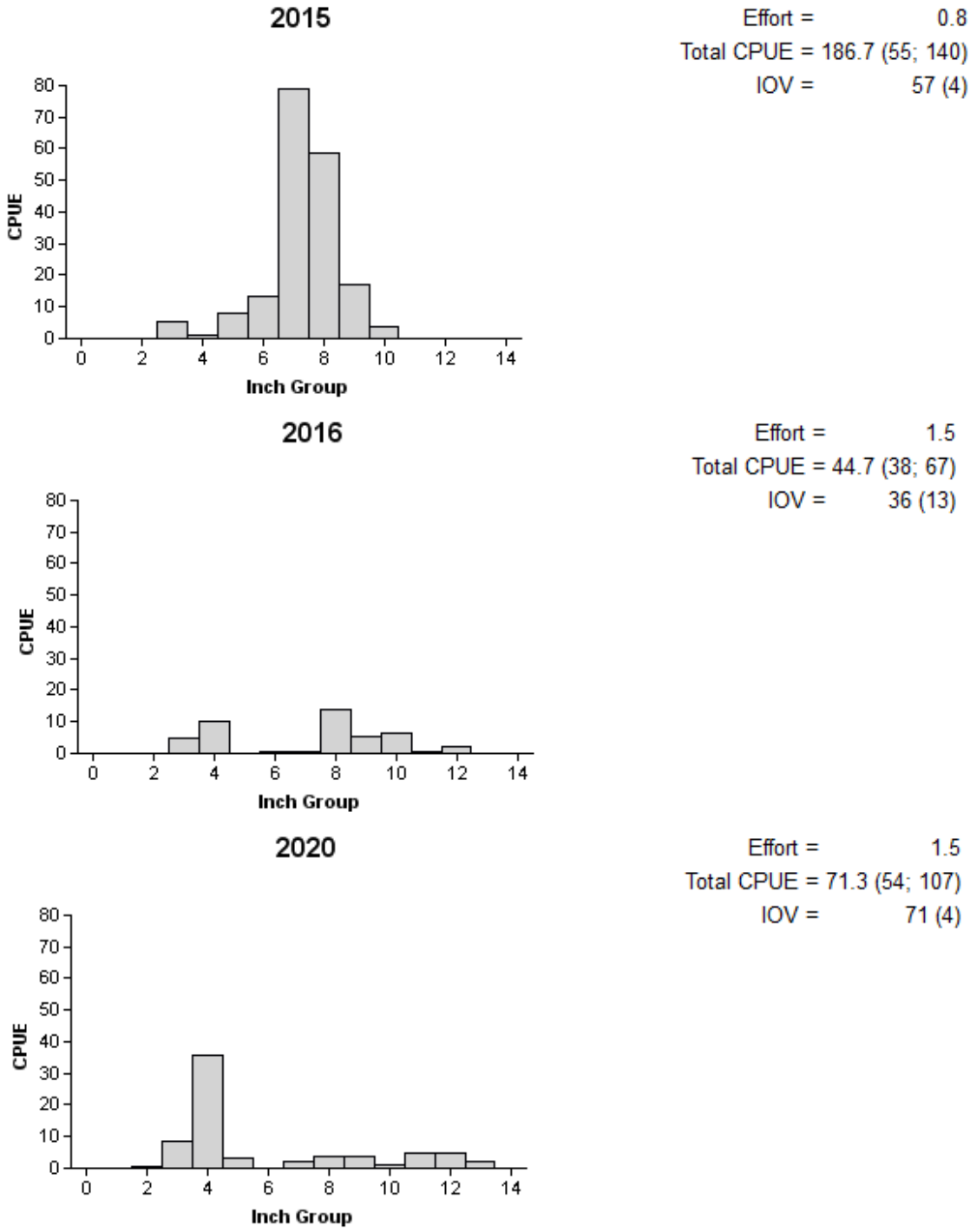


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Medina Reservoir, Texas, 2015, 2016, and 2020.

Bluegill

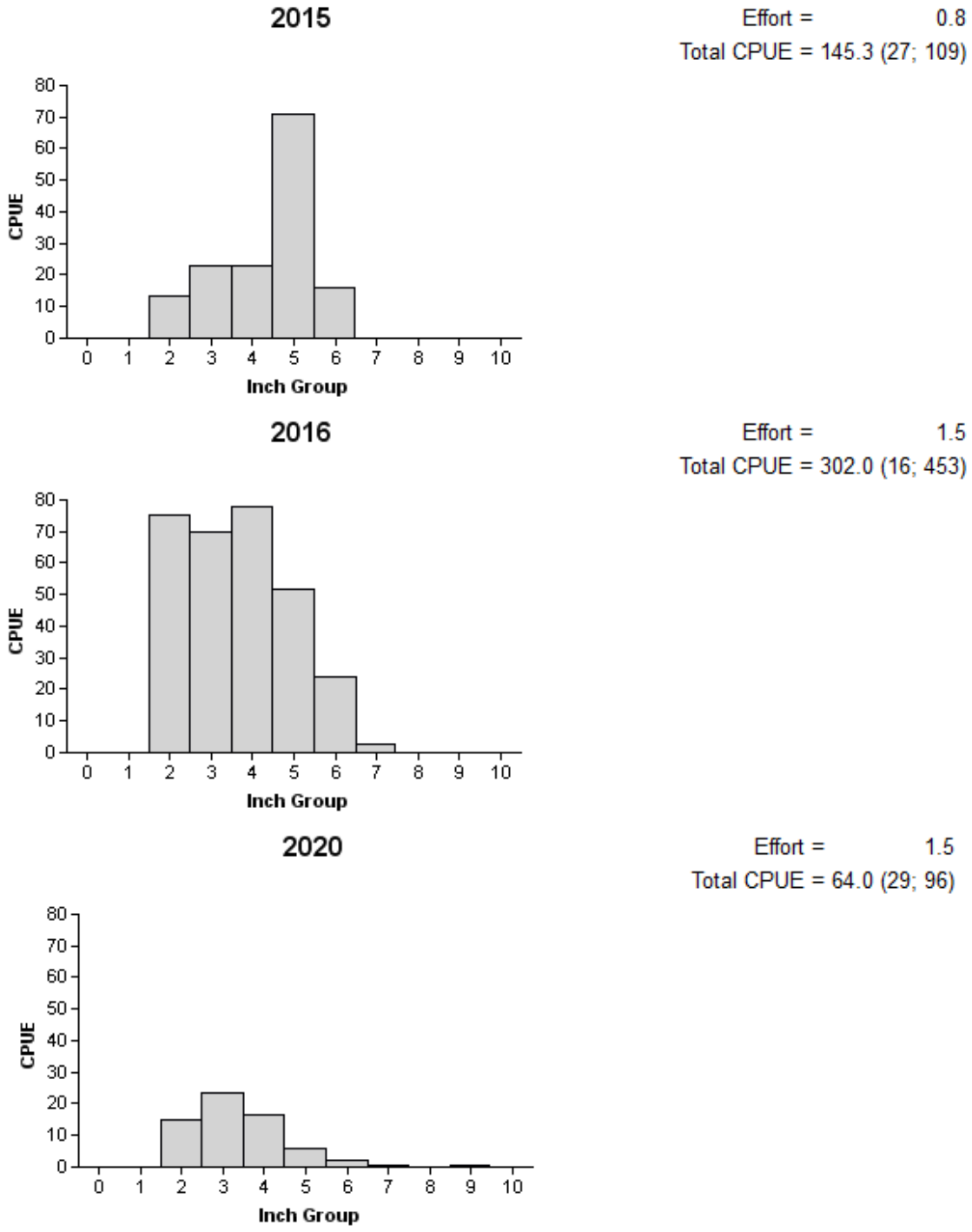


Figure 3. Number of Bluegill caught per hour (CPUE) for fall electrofishing surveys, Medina Reservoir, Texas, 2015, 2016, and 2020. RSE and number of fish collected are shown in parenthesis.

Blue Catfish

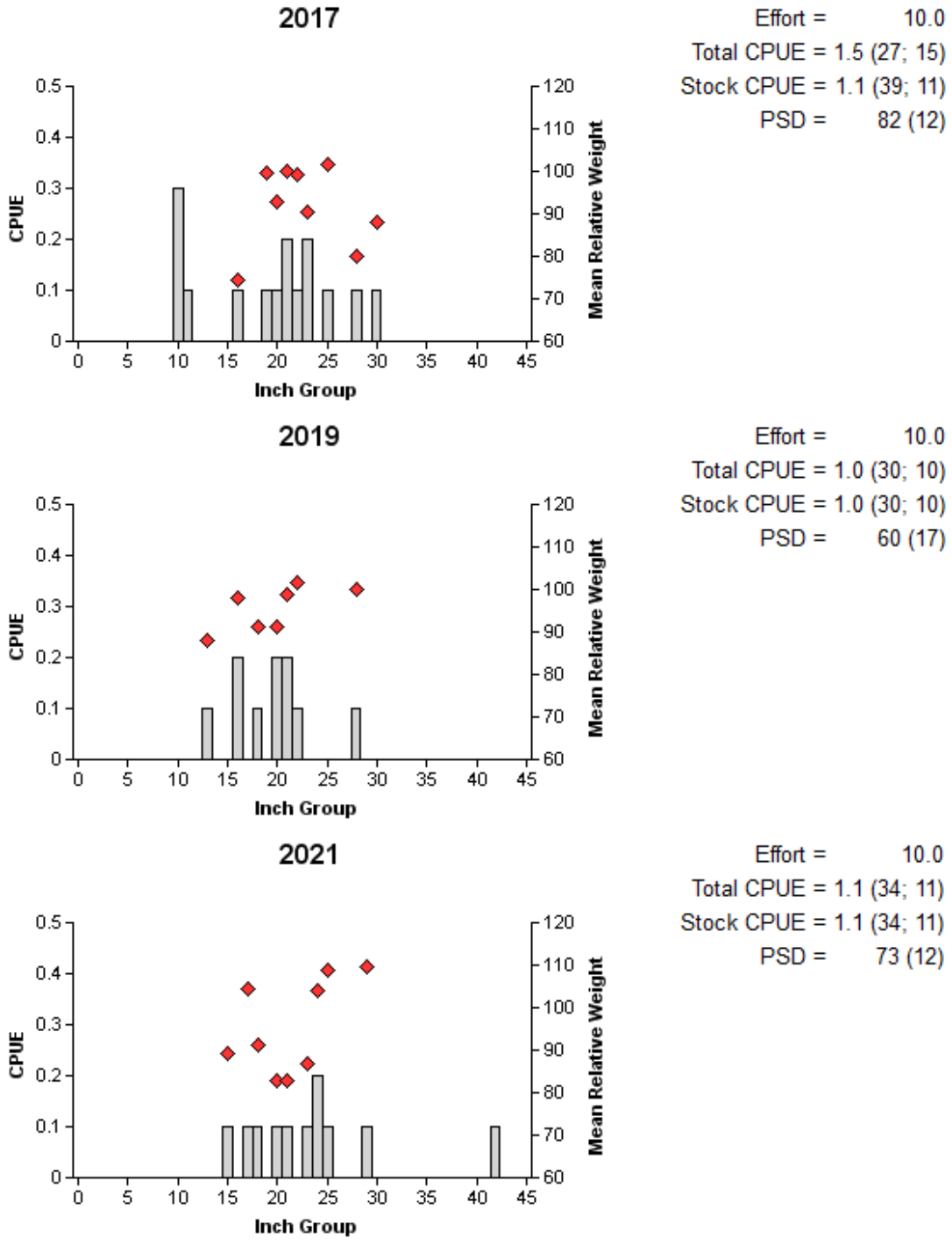


Figure 4. Number of Blue Catfish caught per net night (CPUE), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2017, 2019, and 2021.

Channel Catfish

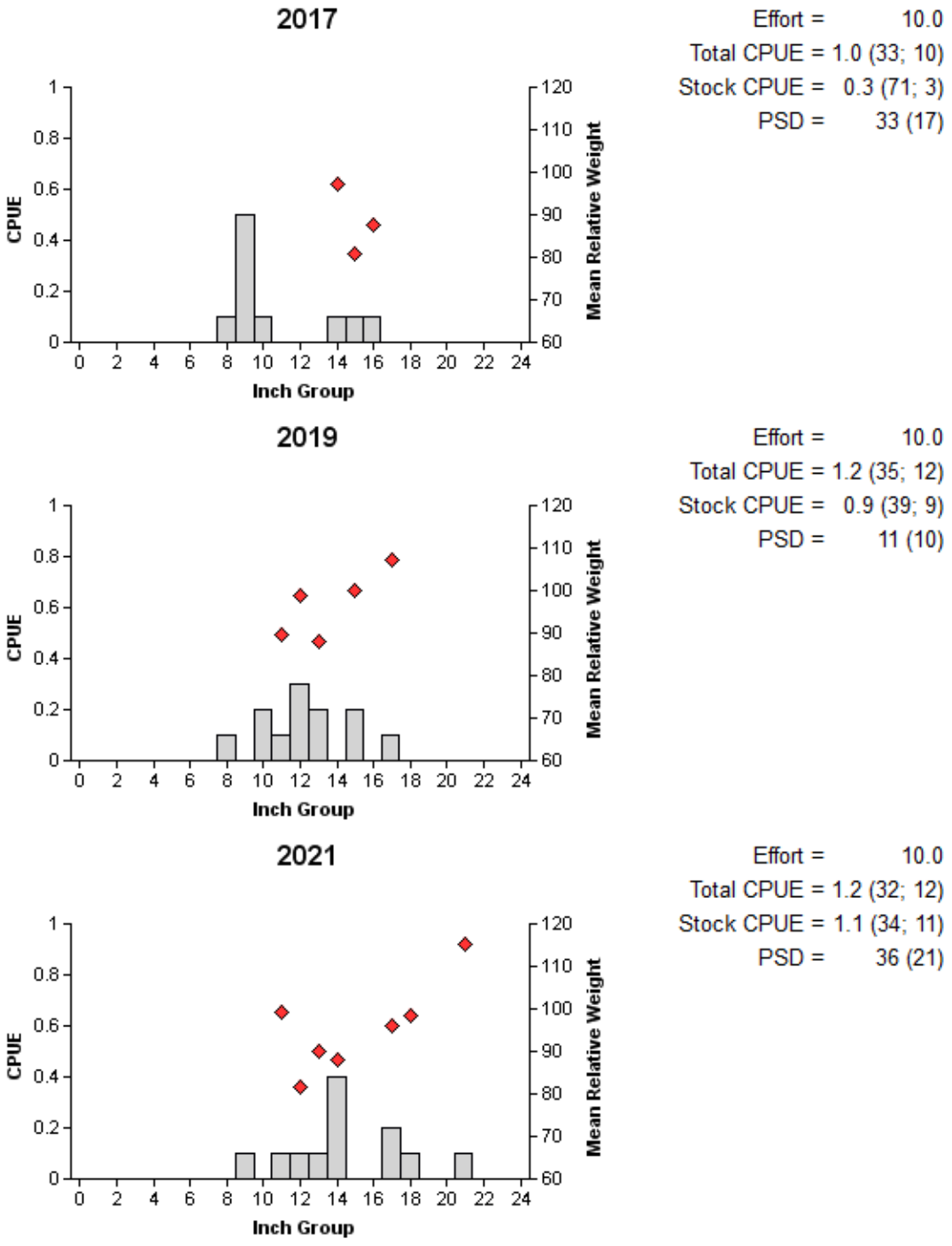


Figure 5. Number of Channel Catfish caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2017, 2019, and 2021.

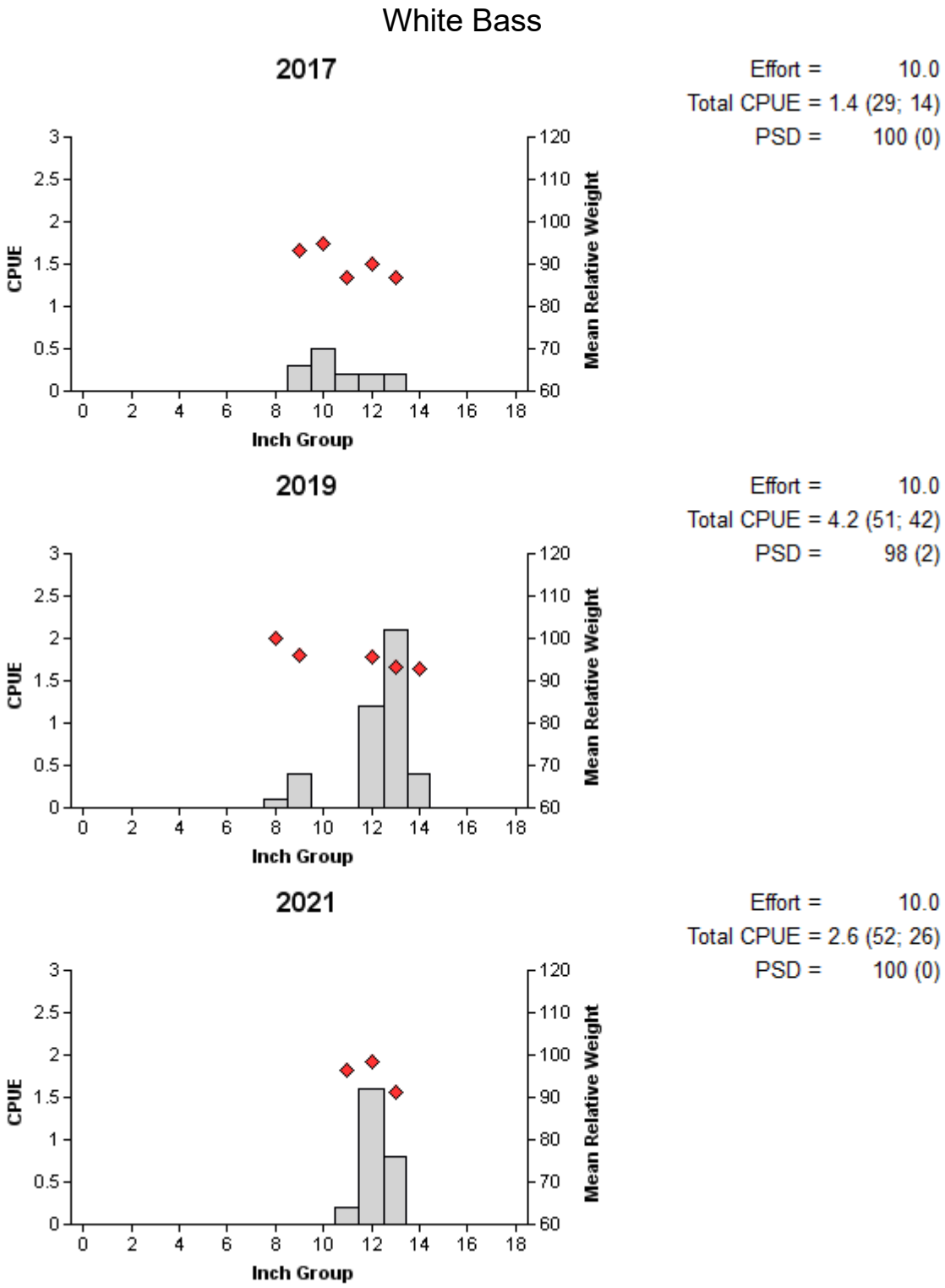


Figure 6. Number of White Bass caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2017, 2019, and 2021.

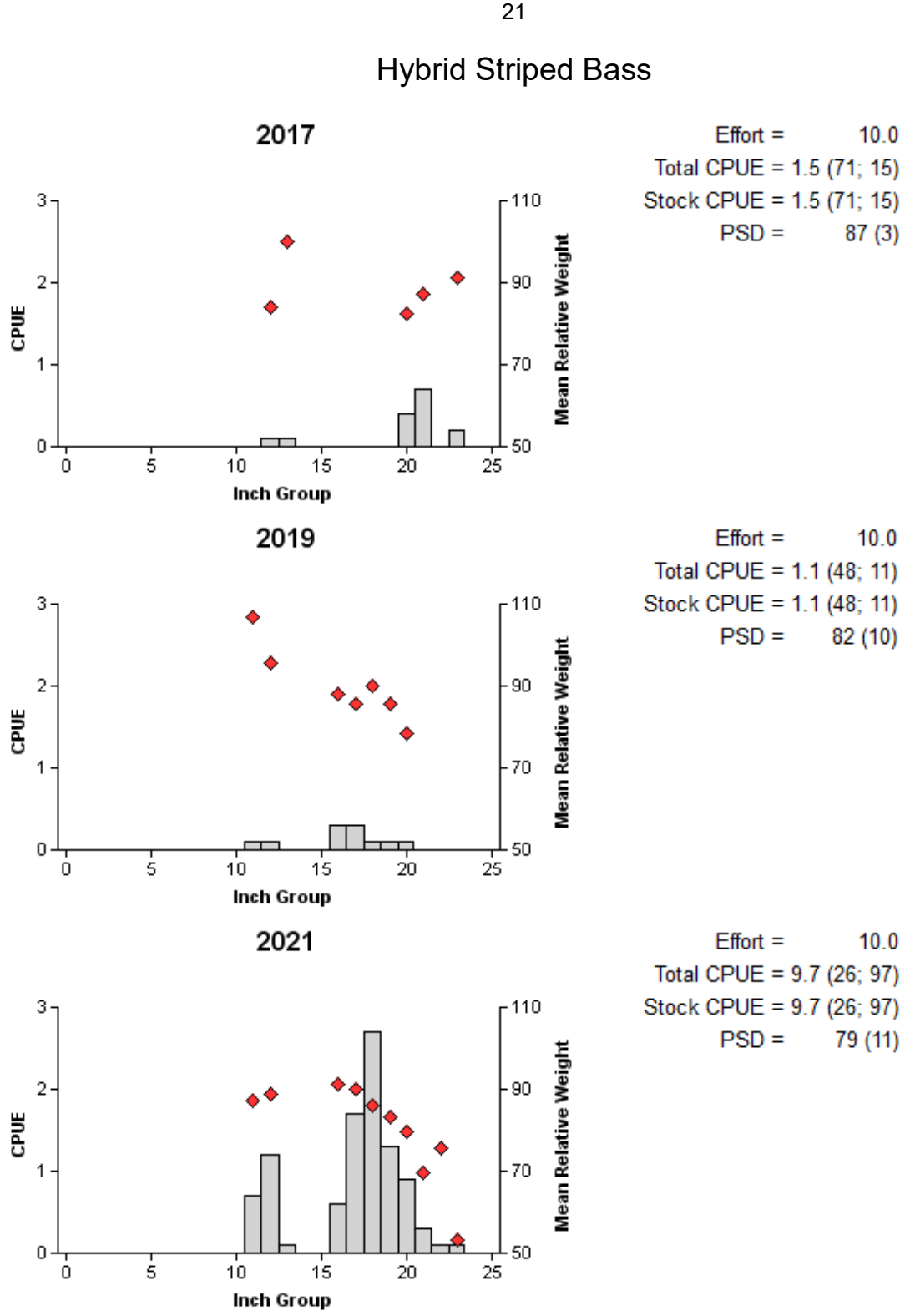


Figure 7. Number of Hybrid Striped Bass caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2017, 2019, and 2021.

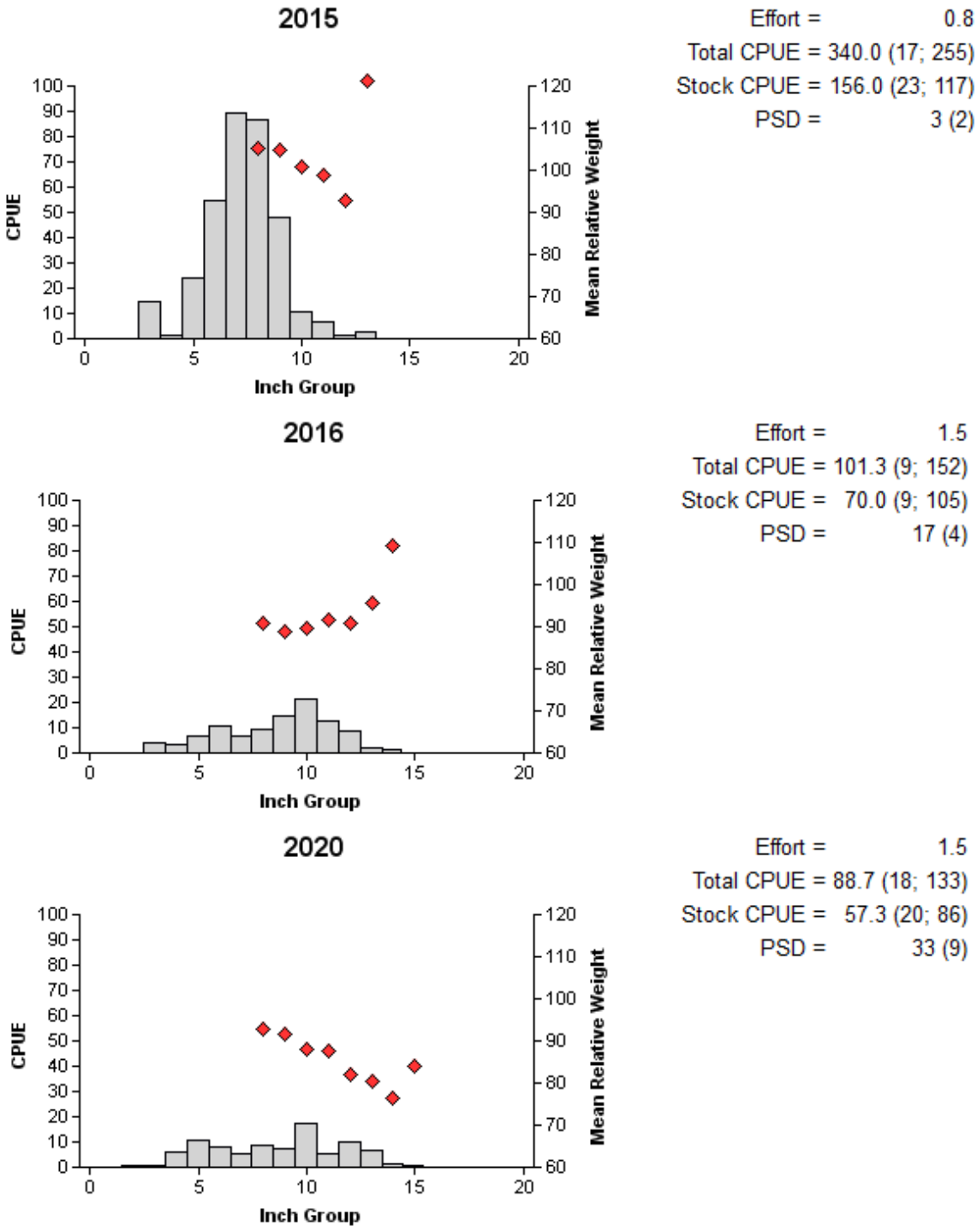


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Medina Reservoir, Texas, 2015, 2016, and 2020.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Medina Reservoir, Texas, 2012, 2016, and 2020. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined using micro-satellite DNA analysis.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2012	30	1	29	0	58.0	3.0
2016	30	5	25	0	59.0	17.0
2020	30	3	27	0	70.0	10.0

Proposed Sampling Schedule

Table 8. Proposed sampling schedule for Medina Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring and electrofishing surveys are conducted in the fall.

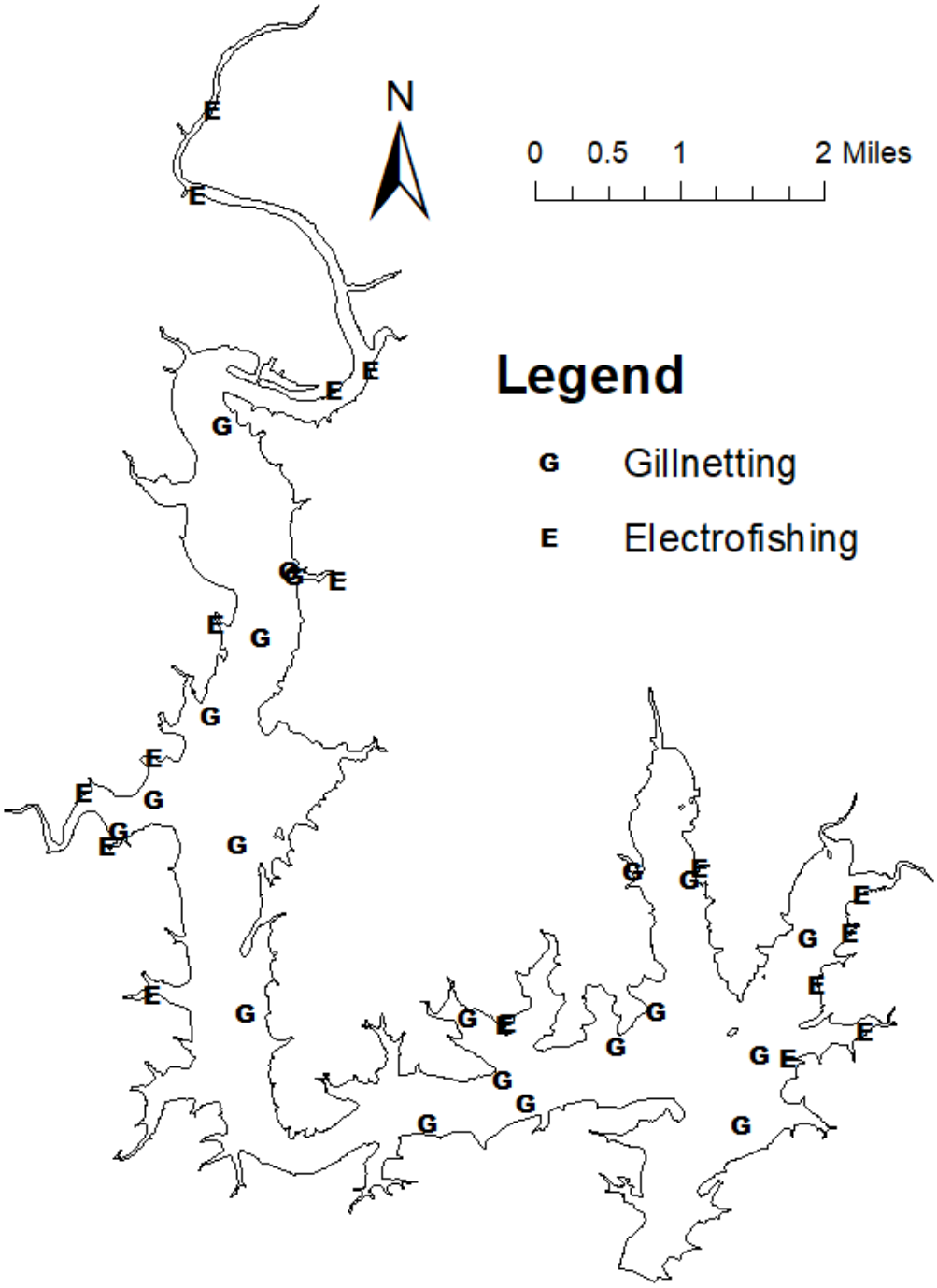
	Survey year			
	2021-2022	2022-2023	2023-2024	2024-2025
Angler Access				X
Vegetation				X
Electrofishing – Fall				X
Gill netting				X
Report				X

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 Medina Reservoir, Texas, 2019-2021. Sampling effort was 10 net nights for gill netting in 2019 and 2021 and 1.5 hours for electrofishing in 2020. Relative standard errors are shown in parenthesis.

Species	Gill Netting 2019		Gill Netting 2021		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad	52	5.2 (34)	121	12.1 (29)	107	71.3 (54)
Threadfin Shad					3	2.0 (73)
Bluegill	1	0.1 (100)			96	64.0 (29)
Redbreast Sunfish					59	39.3 (27)
Green Sunfish					2	1.3 (69)
Warmouth					1	0.6 (100)
Longear Sunfish					3	2.0 (73)
Redear Sunfish					5	3.3 (57)
Largemouth Bass	18	1.8 (34)	19	1.9 (56)	134	89.3 (18)
Guadalupe Bass					3	2.0 (73)
Hybrid Striped Bass	11	1.1 (48)	97	9.7 (26)		
White Bass	42	4.2 (51)	26	2.6 (52)		
White Crappie	15	1.5 (44)	25	2.5 (41)		
Blue Catfish	10	1.0 (30)	11	1.1 (34)		
Channel Catfish	12	1.2 (35)	12	1.2 (32)		
Flathead Catfish	3	0.3 (71)	1	0.1 (100)		
Longnose Gar	11	1.1 (48)	46	4.6 (54)		
Common Carp	23	2.3 (32)	26	2.6 (46)	5	3.3 (100)
Smallmouth Buffalo	1	0.1 (100)				
Gray Redhorse	1	0.1 (100)	1	0.1 (100)		

APPENDIX B – Map of sampling locations



Location of sampling sites, Medina Reservoir, Texas, 2019-2021. Gill net and electrofishing stations are indicated by G and E, respectively.

Life's better outside.®

In accordance with Texas State Depository Law, this publication is available at the Texas State Publications Clearinghouse and/or Texas Depository Libraries.