

Amistad 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:

Randall Myers, District Management Supervisor
and
Mitchell Nisbet, Assistant 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

Contents	i
Survey and Management Summary	1
Introduction.....	2
Reservoir Description.....	2
Angler Access	2
Management History	2
Methods.....	4
Results and Discussion.....	5
Fisheries Management Plan for Amistad Reservoir, Texas.....	6
Objective-Based Sampling Plan and Schedule (2021-2025).....	7
Literature Cited.....	9
Tables and Figures	10
Water Level	10
Reservoir Characteristics	11
Boat Ramp Characteristics	11
Harvest Regulations.....	12
Stocking History	13
Objective-Based Sampling Plan for 2016-2019.....	14
Aquatic Vegetation Survey.....	15
Gizzard Shad	16
Bluegill.....	17
Redbreast Sunfish.....	18
Redear Sunfish	19
Blue Catfish.....	20
Channel Catfish.....	21
White Bass	22
Striped Bass.....	23
Largemouth Bass	24
Proposed Sampling Schedule.....	28
Appendix A – Map of Sampling Locations	29
Appendix B – Catch Rates for All Species and Gear Types.....	30

Survey and Management Summary

Fish populations in Amistad Reservoir were surveyed in 2020-2021 using electrofishing and gill netting. Historical data are presented for comparison. This report summarizes the survey results and contains a management plan for the reservoir based on those findings.

Reservoir Description: Amistad Reservoir (63,680 acres when full) was constructed in 1969 on the Rio Grande River. It is managed by the International Boundary and Water Commission to provide water for irrigation and hydro-electric power generation. The National Park Service (NPS) maintains nine public boat ramps providing excellent angler access. Water level ranged from 30 to 48 feet below conservation pool elevation during the current study period. Aquatic vegetation occurrence was low during the study period (9%) relative to occurrence in previous years (17-36%).

Management History: Important sport fishes include Largemouth Bass, Smallmouth Bass, catfishes, Striped Bass, and White Bass. Striped Bass have been stocked in most years since 1974. Florida Largemouth Bass (FLMB) were stocked periodically from 1975 to 2006 and annually since 2010 to improve FLMB introgression and trophy Largemouth Bass potential. Angler harvest of all sport fishes has been regulated according to statewide size and bag limits. Since 2004, the NPS has regulated Largemouth Bass tournaments via a tournament permitting program.

Fish Community

- **Prey species:** Gizzard Shad and sunfishes are the primary prey in the reservoir. Relative abundance of Gizzard Shad and combined sunfishes was greater in 2020 than in previous years. Likewise, Gizzard Shad Index of Vulnerability was greater in 2020 than in previous years. Overall, prey abundance and size was sufficient to support existing predator species populations.
- **Catfishes:** Blue Catfish and Flathead Catfish are present in the reservoir, but in low relative abundance. Channel Catfish relative abundance was greater in 2021 than in previous years.
- **Temperate Basses:** In 2021, White Bass relative abundance was substantially greater than in previous years and Striped Bass relative abundance was similar to previous years. Legal-length White Bass and Striped Bass averaged two and three years old, respectively.
- **Largemouth Bass:** Relative abundance of Largemouth Bass was similar to or greater in 2020-2021 than in previous years. Proportional size distribution values were consistent across years; however, sub-stock fish comprised a larger fraction of the population. Legal-length Largemouth Bass averaged 4.1 years old. Genetic introgression of Florida Largemouth Bass into the population was slightly lower in 2020 than in previous years.

Management Strategies: Evaluate past stockings of Striped Bass by assessing the fishery in 2022 using a creel survey. Continue stocking FLMB annually to maintain high FLMB introgression and trophy potential. Conduct electrofishing, gill netting, and vegetation surveys every other year, and a creel survey every 3-5 years.

Introduction

This document is a summary of fisheries independent data collected from Amistad Reservoir in 2020-2021. 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 2020-2021 data for comparison.

Reservoir Description

Amistad Reservoir is a Texas-Mexico border impoundment constructed on the Rio Grande River in 1969 for flood control, domestic and agricultural water supply, and hydro-electric power generation. Ownership of water is shared between Mexico (46%) and the U.S. (54%). The reservoir encompasses 63,680 acres at conservation pool elevation, with 34,312 acres located within Texas' jurisdiction. The reservoir lies within the Amistad National Recreation Area and has an undeveloped shoreline which is managed by the National Park Service (NPS). The reservoir experiences dramatic water level fluctuations due to variable rainfall and water releases (Figure 1). In December 2018, three water samples from the reservoir tested positive for Zebra Mussel eDNA, but follow-up samples tested negative and shoreline surveys have not revealed any adult mussels. The reservoir is currently a popular site for local and regional scale black bass tournaments with national level events held historically at the reservoir. The total economic value of the fishery was estimated to be \$22.7 million in 2007 (Schuett et al. 2012). Commercial netting (gill and hoop) is legal on the Mexico side of the reservoir, however this activity has been rarely observed. Other descriptive characteristics for the reservoir are in Table 1.

Angler Access

The NPS maintains nine public boat ramps at the reservoir, four of which are only functional when water level is at or near conservation pool elevation. The NPS also provides two fish cleaning stations and operates a tournament permitting and scheduling program to avoid over-crowding at boat ramps and to obtain tournament catch statistics. Shoreline angling access is limited, and fishing is not allowed at boat ramp locations per NPS rule. Boat ramp characteristics are in Table 2.

Management History

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

1. Annually stock Striped Bass fingerlings at 3-5 fish/acre and conduct biennial gill net surveys to assess the population and a creel survey in 2021 to quantify the fishery.

Action: Striped Bass fingerlings were requested for stocking in 2020 and 2021; however none were stocked in 2020 due to reduced fish production at TPWD hatcheries. A total of 713,282 fry were stocked in 2021. A gill net survey was conducted in the spring of 2021. The creel survey planned for 2021 was rescheduled to 2022 due to restrictions associated with Covid-19.

2. Stock Florida Largemouth Bass (FLMB) fingerlings annually at the rate of 1,000/km of shoreline to maintain a high-level of FLMB introgression and maximize production of trophy fish. Assess the population by using spring and fall electrofishing.

Action: A total of 292,562 and 297,295 FLMB fingerlings were stocked in 2020 and 2021, respectively. Electrofishing surveys were conducted in fall of 2020 and spring 2021.

3. 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 2020, and no newly occurring invasive aquatic plant species were found. “Clean, Drain, and Dry” signs remain posted at public boat ramps. Zebra Mussel eDNA was positively identified in water samples in 2018. Follow-up surveys have not confirmed presence of adults.

Harvest regulation history: Harvest of all sport fishes has been managed according to statewide regulations since reservoir impoundment (Table 3).

Stocking history: Florida and Northern strain Largemouth Bass, Blue Catfish, Channel Catfish, Smallmouth Bass, White Crappie, Striped Bass, Palmetto Bass, Walleye, Northern Pike, and Muskellunge have been stocked into the reservoir. Striped Bass and FLMB are the only species to have been regularly stocked during the last 20 years. Stockings of FLMB have been conducted to maintain high FLMB introgression and Largemouth Bass trophy potential and stockings of Striped Bass have been conducted to support a population as this species does not successfully reproduce in the reservoir. The complete stocking history is in Table 4.

Vegetation/habitat management history: Aquatic vegetation has been routinely monitored and quantified. In 2012, a few dozen left over Christmas trees donated by Home Depot in Del Rio were secured to large cement blocks and deployed as a fish attractor.

Water transfer: Amistad Reservoir is used to store, conserve, and distribute water for downstream water supply needs in both Mexico and the United States. Rio Grande River water is allocated per terms of a treaty formed in 1944 between the two countries. Each country has separate operational control of the dam and release water in response to downstream water needs. No inter-basin transfer of water is known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the 2019-2023 objective-based sampling (OBS) plan for Amistad Reservoir (Nisbet and Myers 2018). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, except when otherwise specified, and all surveys were conducted according to Fishery Assessment Procedures (Texas Parks and Wildlife Department 2017). A reservoir map showing sampling locations is contained in Appendix A.

Electrofishing – Largemouth Bass, Smallmouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by night-time electrofishing (24, 5-min stations) during fall 2020. Largemouth Bass and Smallmouth Bass were collected by day-time electrofishing (24, 5-min stations) during spring 2021. 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 (N=13) were determined using otoliths from 13.0-14.9 inch (total length) fish collected during fall to estimate average age at legal-length (14 inches).

Gill netting – Catfishes, Striped Bass and White Bass were collected by gill netting (16 net nights at 16 different stations) in spring of 2021, at biologist selected stations within the Castle Canyon embayment (8 net-nights at 8 different stations) and the Devils River arm of the reservoir (8 net-nights at 8 different stations). Catch-per-unit-effort for gill netting was recorded as the number of fish caught per net-night (fish/nn). Striped Bass (N=9) and White Bass (N=10) ages were determined using otoliths from fish between 17.0-18.9 inches and 9.0-10.9 inches, respectively to estimate average age at legal length (18 inches).

Genetics – Genetic analysis of Largemouth Bass was conducted according to Fishery Assessment Procedures (Texas Parks and Wildlife Department 2017). Micro-satellite DNA analysis was used to determine genetic composition of 29 individual fish collected randomly via electrofishing in fall 2020.

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 ($RSE = 100 \times SE$ of the estimate/estimate) was calculated for all CPUE and creel statistics.

Habitat - A survey was conducted using the random point sampling method (N= 182 points) during September 2020 to estimate percent occurrence of aquatic vegetation species and habitat types according to Fishery Assessment Procedures (Texas Parks and Wildlife Department 2017).

Water level - Source for water level data was the International Boundary Water Commission (IBWC 2021).

Results and Discussion

Habitat: Water level remained between 30 and 48 feet below conservation pool elevation during the study period (June 2019-April 2021; Figure 1). Percent occurrence of combined aquatic vegetation in 2020 (9%) was much lower than in previous years (17-36%; Table 6). Hydrilla was the predominant aquatic plant species present in the reservoir in 2020 (8%).

Prey species: Relative abundance of prey species was generally greater in 2020 than in previous years. Sunfishes comprised the majority of the prey base, with Redbreast Sunfish the most abundant species. Electrofishing CPUE of Gizzard Shad in 2020 (86.5/h) was greater than in previous years (38.0-49.5 fish/h; Figure 2). Likewise, Gizzard Shad IOV was greater in 2020 (43) than in previous years (3-29). However, electrofishing CPUE of Threadfin Shad was lower in 2020 (6.0 fish/h; Appendix B) than in 2018 (64.5 fish/h; Nisbet and Myers 2018). Electrofishing CPUE of Bluegill in 2020 (50.0 fish/h) was similar to in 2018 (54.0 fish/h; Figure 3). Electrofishing CPUE of Redbreast Sunfish (294.5 fish/h; Figure 4) and Redear Sunfish (17.5 fish/h; Figure 5) in 2020 were greater than in previous years. Electrofishing CPUE of combined sunfishes was markedly greater in 2020 (362 fish/h) than in previous years (92-230.5 fish/h). The increased relative abundance of Gizzard Shad and combined sunfishes should be beneficial to the predator species populations.

Catfishes: Channel Catfish, Blue Catfish, and Flathead Catfish were present in the reservoir, but in low abundance. In 2021, gillnet CPUE of Blue Catfish and Flathead Catfish was <0.6 fish/h (Figure 6 and Appendix B). Gillnet CPUE of Channel Catfish was greater in 2021 (3.9 fish/nn) than in 2019 (1.0 fish/nn), with most fish collected in 2021 having a $W_r > 80$ (Figure 7). Both juvenile and adult Blue Catfish and Channel Catfish were collected in 2021; the largest Blue Catfish was 24 inches and the largest Channel Catfish was 22 inches.

White Bass: Gillnet CPUE of White Bass in 2021 (6.9 fish/nn; Figure 8) was greater than in previous years (1.6-2.0 fish/h). In 2021, all White Bass collected exceeded stock-length, and PSD (76) was similar to previous years (66-84). Use of the sampling protocol set forth in the previous OBS plan yielded a total catch of 111 White Bass, achieved the sampling objective of ≥ 25 stock fish, resulted in a RSE of 28 for CPUE-stock, and a SE of 6 for PSD. The large majority of White Bass collected in 2021 had a W_r between 80 and 85. All 10 of the aged White Bass were from the 2019 cohort indicating an average age of two for legal-length fish.

Striped Bass: Gill net CPUE of Striped Bass in 2021 (3.4 fish/nn; Figure 9) was similar to in previous years (2.9 fish/nn). In 2021, all fish collected ranged from 17 to 23 inches and PSD (53) was greater than in previous years. The absence of smaller fish was a product of not stocking in 2019 and 2020. The large majority of Striped Bass collected in 2021 had a $W_r < 80$ which indicates that body condition has decreased compared to previous years when >50% of fish had a $W_r > 80$. All nine aged Striped Bass were from the 2018 cohort indicating an average age of three for legal-length fish.

Largemouth Bass: Fall electrofishing CPUE of Largemouth Bass was greater in 2020 (80.5 fish/h) than in previous years (45.5-58.5 fish/h; Figure 10) and similar to the historic average of 83 fish/h (Figure 12). Spring electrofishing CPUE was greater in 2021 (90.5 fish/h) than 2019 (65.5 fish/h) and the historic average of 65.2 fish/h, but similar to in 2017 (84.0 fish/h; Figure 11). Proportional size distribution values were consistent across years for both fall (PSD = 46-58) and spring samples (PSD = 60-68). However, sub-stock fish comprised a larger fraction of sampled fish in fall 2020 (26%) than fall 2018 (14%) and in spring 2021 (20%) than in spring 2019 (5%) suggesting an overall decline in size structure, possibly caused by slower growth in response to decreased water level and aquatic vegetation abundance during the study period. Ages of the 13 fish ranging from 13.1 to 15.0 inches corresponded to four different year classes (2014-2017) and averaged 4.1 years, which is slower than previously reported (2.5 years; Nisbet and Myers 2018). Genetic introgression of FLMB into the population in 2020 (68% FLMB alleles) was lower than in previous years, with 3% of sampled fish identified as non-intergrade FLMB genotype (Table 7).

Fisheries Management Plan for Amistad Reservoir, Texas

Prepared - July 31, 2021

ISSUE 1: Striped Bass which do not naturally reproduce in the reservoir have been stocked since the mid-1970s to support a fishery for the species; however, utilization of this fishery has decreased over time. Historically, the Striped Bass fishery supported numerous guides and produced catches of very large fish; the water body record weighed 44 pounds. The 2021 gillnet survey revealed that relative abundance of Striped Bass was similar to previous years despite not stocking since 2018. However, the most recent creel survey (2018) estimated that only <0.5% of total angling effort was specifically directed toward this species. Additional quantification of the fishery is necessary to determine if stockings should continue.

MANAGEMENT STRATEGY

1. Cease annual stockings and perform creel survey in 2022 (January-June) to quantify contribution of past stockings to the fishery.

ISSUE 2: Amistad Reservoir is well known for its high-quality Largemouth Bass fishery and for catches of trophy-size fish. The reservoir has been ranked in the top 10 bass fishing destinations by a national fishing media organization, and 260 Largemouth Bass weighing between 7 to 10 pounds were reported caught during the January-June 2018 creel survey.

MANAGEMENT STRATEGY

1. Annually stock FLMB fingerlings at the rate of 1,000/km of shoreline to maintain a high-level Florida bass introgression and maximize production of trophy fish.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels 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. Check for presence of Zebra Mussels and other aquatic invasive species at reservoir boat ramps during all visits to the reservoir.
2. Coordinate control activities (if needed) with the controlling authority (IBWC), NPS, and the Val Verde County government.
3. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
4. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc., so that they can in turn educate their customers.
5. Educate the public about invasive species through the use of media and the internet.
6. Make a speaking point about invasive species when presenting to constituent and user groups.
7. Keep track of 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 Amistad Reservoir include Largemouth Bass, Channel Catfish, White Bass, Striped Bass, and Smallmouth Bass. Known important forage species include Bluegill, Redbreast Sunfish, and Gizzard Shad. Sampling schedule is in Table 8.

Low-density fisheries

These are Blue Catfish, Flathead Catfish, and White Crappie. The presence or absence of these species will be determined via gill net sampling.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are the most highly sought sport fish in the reservoir, accounting for 86% of the total fishing effort in 2018 (Nisbet and Myers 2018). The reservoir is renowned for providing a high quality largemouth bass fishery and historically was considered a top bass fishing destination in the U. S. However, the reservoir experiences extreme water level fluctuations, with coincident changes in habitat leading to fluctuations in the Largemouth Bass population. Since 2001, Largemouth Bass have been sampled on a biennial basis to assess relative abundance, size structure, growth, and Florida Bass genetic introgression. Continued biennial sampling is necessary to monitor population trends and respond to stakeholder concerns. Fall night time electrofishing will occur every other fall (2022 and 2024) and spring day-time bass-only electrofishing will occur every other spring (2023 and 2025). The fall surveys will consist of at least 24 randomly selected 5-minute stations. Based on historic electrofishing data, this level of sampling effort will achieve an RSE ≤ 25 for CPUE-stock, collection of ≥ 50 stock-sized fish for size structure determination, 30 fish for genetic analysis, and 13 fish between 13.0 and 14.9 inches for age and growth analysis. Similarly, spring surveys will consist of 24 randomly selected stations which will likewise achieve ≥ 50 stock-sized fish for size structure determination and a RSE ≤ 25 for CPUE-stock. Should sampling objectives unexpectedly not be met, no additional sampling will be conducted. Fishing quality (as determined by directed effort and angler catch rates) will be measured with a 6-month access point creel survey conducted January through June, 2022, with sampling occurring 16 days each 3-month quarter. Effort will be evenly split between weekend days and weekdays. Non-uniform probability sampling will occur at the five most used boat ramps based on vehicle count data collected by the National Park Service.

Smallmouth Bass: Electrofishing surveys do not sample Smallmouth Bass effectively in Amistad Reservoir; however, anglers do report catches of these fish. Our survey objective is to monitor for large-scale changes in this fishery using the 2022 creel survey with no predefined sampling objectives.

Blue Catfish and Channel Catfish: Catch of these species in historic gill net surveys has been very low (CPUE < 2.0), and angling effort targeting catfishes represented only 1-7% of total angling effort according to past creel surveys. Thus, our survey objective is to monitor for large-scale changes in the catfish fishery and community using gill net sampling (described below) and the 2022 creel survey. No fish sample size and precision targets are predefined for both gill net and creel surveys.

White Bass: Angling effort exclusively targeting White Bass accounted for 1-5% of total angling effort in past creels. The monitoring objective for White Bass is to determine large-scale changes in the population (i.e., relative abundance and size structure) and fishery. Field observations suggest that most anglers targeting this species fish in the Castle Canyon embayment and Devils River arm of the reservoir from January through March. To maximize capture efficiency, sampling will be accomplished using gill nets at biologist-selected stations in each of those areas. A minimum of eight nets will be set for one night in each area. This sampling protocol has been used since 2017 and yielded capture of 25-32 White

Bass and RSEs of 30-39 for CPUE-total. The next gill net sampling event will occur in 2023. The White Bass fishery will be assessed using the 2022 creel survey. No fish sample size and precision targets are predefined for both gill net and creel surveys.

Striped Bass: This species has been stocked into the reservoir in most years since 1974, and in recent years, at a low rate of 3-5 fingerlings/acre. Angling effort exclusively targeting Striped Bass has declined over time according creel surveys, and most recently, accounted for <0.5% of total angling effort. Annual stockings will cease because of low angler utilization. The short-term monitoring objective for Striped Bass is to determine population and fishery response to recent stockings, including the fry stocking occurring in 2021. Field observations suggest that most anglers targeting this species fish in the Castle Canyon embayment and Devils River arm of the reservoir from January through March. As such, the gill net survey protocol described above for White Bass will likewise be used to assess population trends. This sampling protocol has been used since 2017 and yielded capture of 46-47 Striped Bass and a RSE of 20 for CPUE-total. The next gill net sampling event will occur in 2023. No fish sample size and precision targets are predefined for both gill net and creel surveys.

Sunfishes and Shad spp.: Bluegill, Redbreast Sunfish, Threadfin Shad, and Gizzard Shad are the primary forage fishes at Amistad Reservoir. Assessment of these species' populations will be accomplished via electrofishing surveys in fall of 2022 and 2024. The sampling intensity of 24 random stations should provide adequate precision ($RSE \leq 25$) for CPUE to detect major changes in relative abundance of sunfishes. Historically, Gizzard Shad and Threadfin Shad CPUEs have been highly variable, which was likely due to dynamic habitat conditions caused by extreme water level fluctuation and the low capture efficiency of these species with electrofishing. No fish sample size and precision targets are predefined for these species.

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.
- 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.
- International Boundary and Water Commission (IBWC). 2021. Web interface. <http://www.ibwc.gov/home.html> (2019).
- Nisbet M., and Myers, R. A. 2018. Statewide freshwater fisheries monitoring and management program survey report for Amistad Reservoir, 2018. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-3, Austin.
- Shuett, M. A., X. Gao, R. J. Shingote, G. T. Kyle, and R. M. Dudensing. 2012. Economic characteristics, attitudes, and behaviors among Lake Amistad Anglers, 2007. Texas A&M University, Department of Recreation, Park, and Tourism Sciences, Center for Socioeconomic Research and Education.
- Texas Parks and Wildlife Department. 2017. Fishery Assessment Procedures, unpublished manual, revised 2017.

Tables and Figures

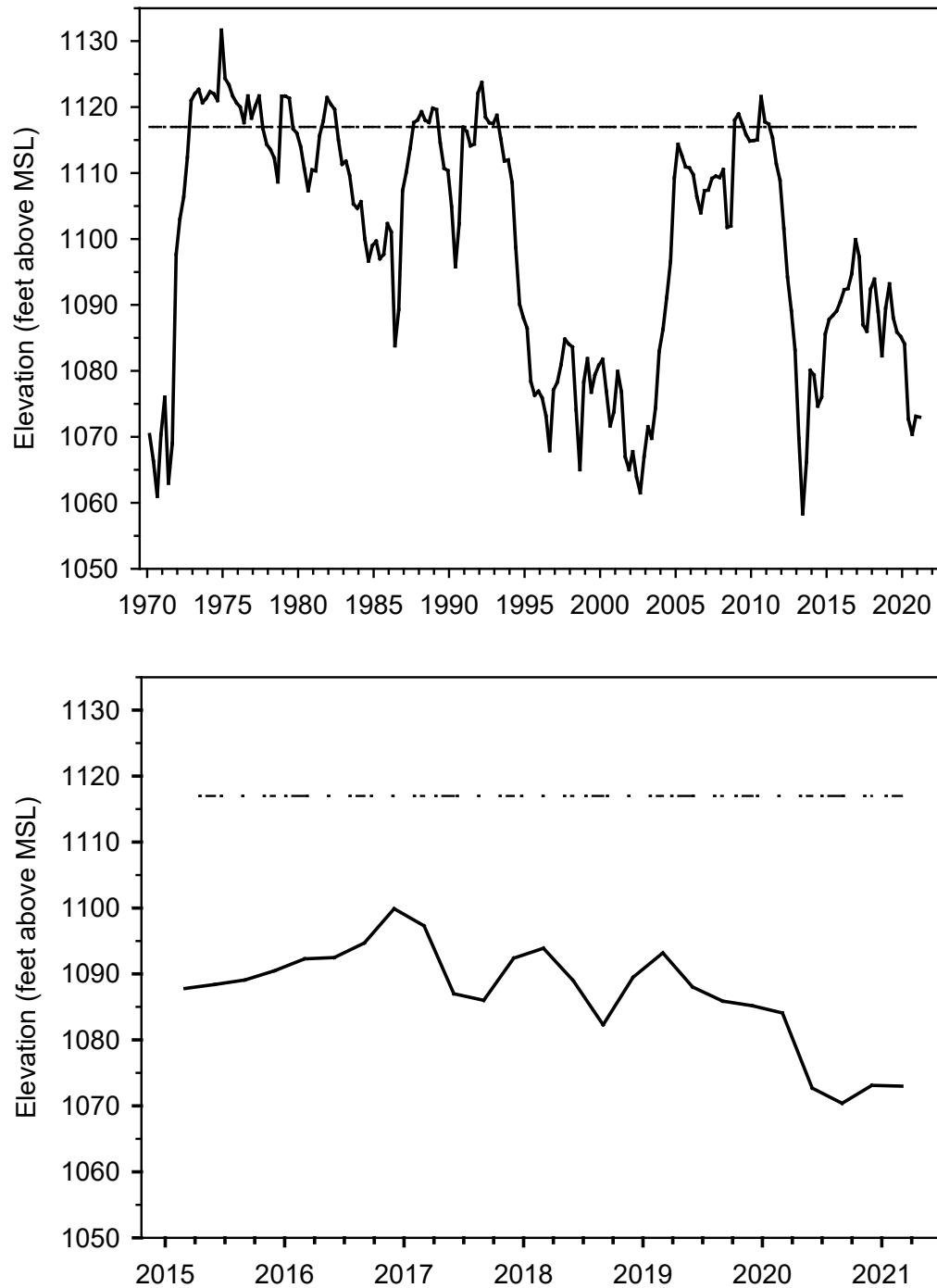


Figure 1. Mean quarterly water level elevation in feet above mean sea level (MSL) from January 1970 to March 2021 (top) and from January 2015 to March 2021 (bottom) at Amistad Reservoir, Texas. Conservation pool elevation is 1,117 feet above MSL and is represented by the dashed horizontal line.

Table 1. Characteristics of Amistad Reservoir, Texas.

Characteristic	Description
Year constructed	1969
Controlling authority	International Boundary and Water Commission
County	Val Verde
Reservoir type	Mainstream
Shoreline Development Index	23.47
Conductivity	871 μ S/cm

Table 2. Boat ramp characteristics for Amistad Reservoir, Texas, September 2020. Reservoir elevation at time of survey was 1,070 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Condition
Diablo East	29.477313 -101.016495	Y	250	Excellent
Black Brush	29.474045 -100.986480	Y	50	Excellent
Air Force	29.473237 -101.037822	Y	50	Excellent
Rough Canyon	29.576928 -100.978195	Y	50	Excellent
Box Canyon	29.524826 -101.173759	Y	50	Excellent
Spur 454	29.465880 -100.956986	Y	10	Fair
277 South	29.494889 -100.907736	Y	10	Fair
277 North	29.509789 -100.906474	Y	10	Fair
Spur 406	29.551029 -101.020351	Y	10	Fair

Table 3. Harvest regulations for Amistad Reservoir, Texas.

Species	Bag Limit	Minimum length limit (inches)
Gar, Alligator	1	None
Catfish: Channel and Blue, their hybrids and subspecies	25*	12
Catfish, Flathead	5	18
Bass, White	25	10
Bass, Striped	5	18
Bass, Largemouth and Smallmouth	5	14
Crappie: White and Black, their hybrids and subspecies	25*	10

*in any combination

Table 4. Stocking history of Amistad Reservoir, Texas. Size categories are FRY = <1-inch, FGL = 1-3 inches, and UNK = Unknown.

Species	Year(s) Stocked	Number of Years	Number Stocked	Size
Blue Catfish	1971	1	5,445	UNK
Channel Catfish	1967–1973	7	486,020	UNK
Florida Largemouth Bass	1975-1980	6	1,694,120	FGL
	1977-1978	2	552,800	FRY
	1992	1	507,075	FGL
	1996-1997	2	631,711	FGL
	2004	1	552,648	FGL
	2008	1	501,874	FGL
	2010-2019	10	4,402,789	FGL
	2020-2021	2	589,857	FGL
ShareLunker Largemouth Bass	2006-2010	3	9,214	FGL
Largemouth Bass	1967-1973	6	3,240,685	UNK
	2004-2005	2	331,743	FGL
Walleye	1954-1978	5	17,393,000	UNK
Striped Bass	1974	1	82,616	FGL
	1976-1982	6	1,099,490	UNK
	1984-1999	11	3,296,938	FGL
	1988-1993	3	1,332,843	FRY
	2000-2018	14	2,626,860	FGL
	2021	1	713,282	FRY
Smallmouth Bass	1975-1983	4	665,250	UNK
White Crappie	1968	1	100	UNK
	1989	1	144,391	FRY
Palmetto Bass	1975-1982	3	1,614,962	UNK
Muskellunge	1976	1	700	UNK
Northern Pike	1976	1	1,030,305	UNK

Table 5. Objective-based sampling plan (OBS) components for Amistad Reservoir, Texas, 2019-2023 (Nisbet and Myers 2018).

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Relative abundance	CPUE-stock	RSE-Stock ≤ 20
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 14 inches	$N = 13, 13.0 - 14.9$ inches
	Body condition	Relative weight	$N \geq 50$ stock
	Genetics	% FLMB	$N = 30$, any age
Bluegill	Relative abundance	CPUE-total	RSE ≤ 20
Redbreast Sunfish	Relative Abundance	CPUE-total	RSE ≤ 20
Gizzard Shad	Relative abundance	CPUE-total	None
	Size structure	Length frequency	None
	Prey availability	IOV	None
<i>Gill netting</i>			
White Bass	Relative abundance	CPUE-stock	$N \geq 25$ stock
	Size structure	Length frequency	$N \geq 25$ stock
	Age-and-growth	Age at 10 inches	None
	Body condition	Relative weight	None
Striped Bass	Relative abundance	CPUE-stock	None
	Size structure	Length frequency	None
	Age-and-growth	Age at 18 inches	None
	Body condition	Relative weight	None

Table 6. Results of random point sampling vegetation surveys conducted at Amistad Reservoir (Texas-side only) in August or September of 2011, 2014, 2016, 2018, and 2020. Percent occurrence is shown for predominate habitat types along with lower and upper 95% confidence interval (in parentheses). N/A indicates instances where the habitat type was not recorded or observed. Reservoir elevation (in feet) relative to conservation pool elevation (1,117.0 feet above mean sea level) and number of random points sampled are provided for reference.

Habitat type/survey metric	2011	2014	2016	2018	2020
Open water	81 (78-85)	73 (67-79)	64 (58-70)	70 (64-76)	91 (86-95)
Flooded terrestrial vegetation	N/A	11 (6-15)	12 (8-16)	8 (5-11)	0 (0)
Combined aquatic vegetation	19 (15-23)	17 (12-22)	36 (30-42)	26 (20-32)	9 (5-14)
Hydrilla	5 (3-8)	9 (5-13)	15 (11-20)	19 (14-24)	8 (5-13)
Pondweed spp.	12 (9-16)	3 (0-5)	16 (12-21)	10 (6-14)	5 (2-9)
Chara	10 (7-13)	2 (0-3)	6 (3-10)	3 (1-5)	1 (0-4)
Relative reservoir elevation	-6	-42	-23	-35	-47
Number of random points	421	195	246	236	182

Gizzard Shad

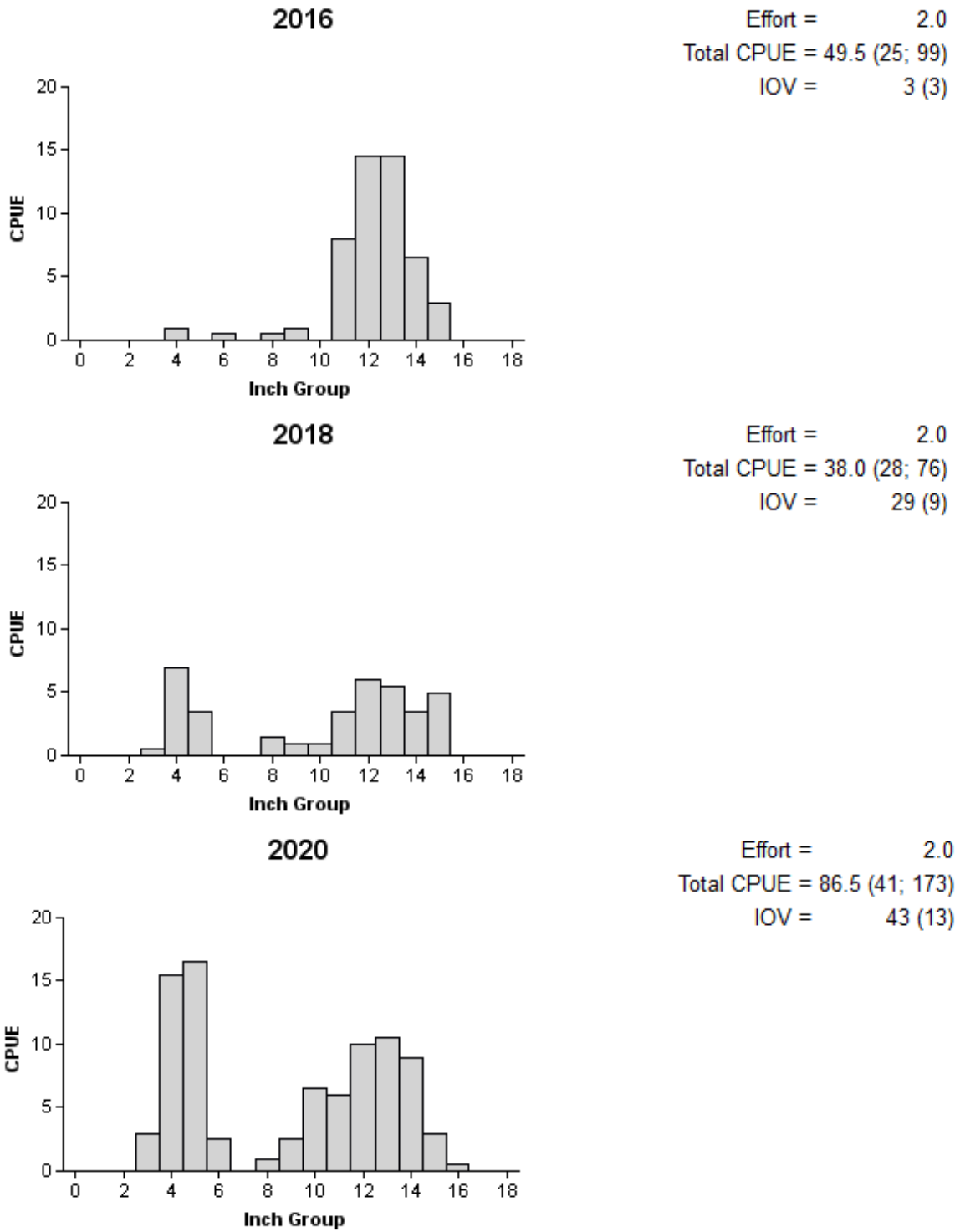


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and IOV for fall electrofishing surveys, Amistad Reservoir, Texas, 2016, 2018, and 2020. RSE and N for CPUE and SE for IOV are in parentheses).

Bluegill

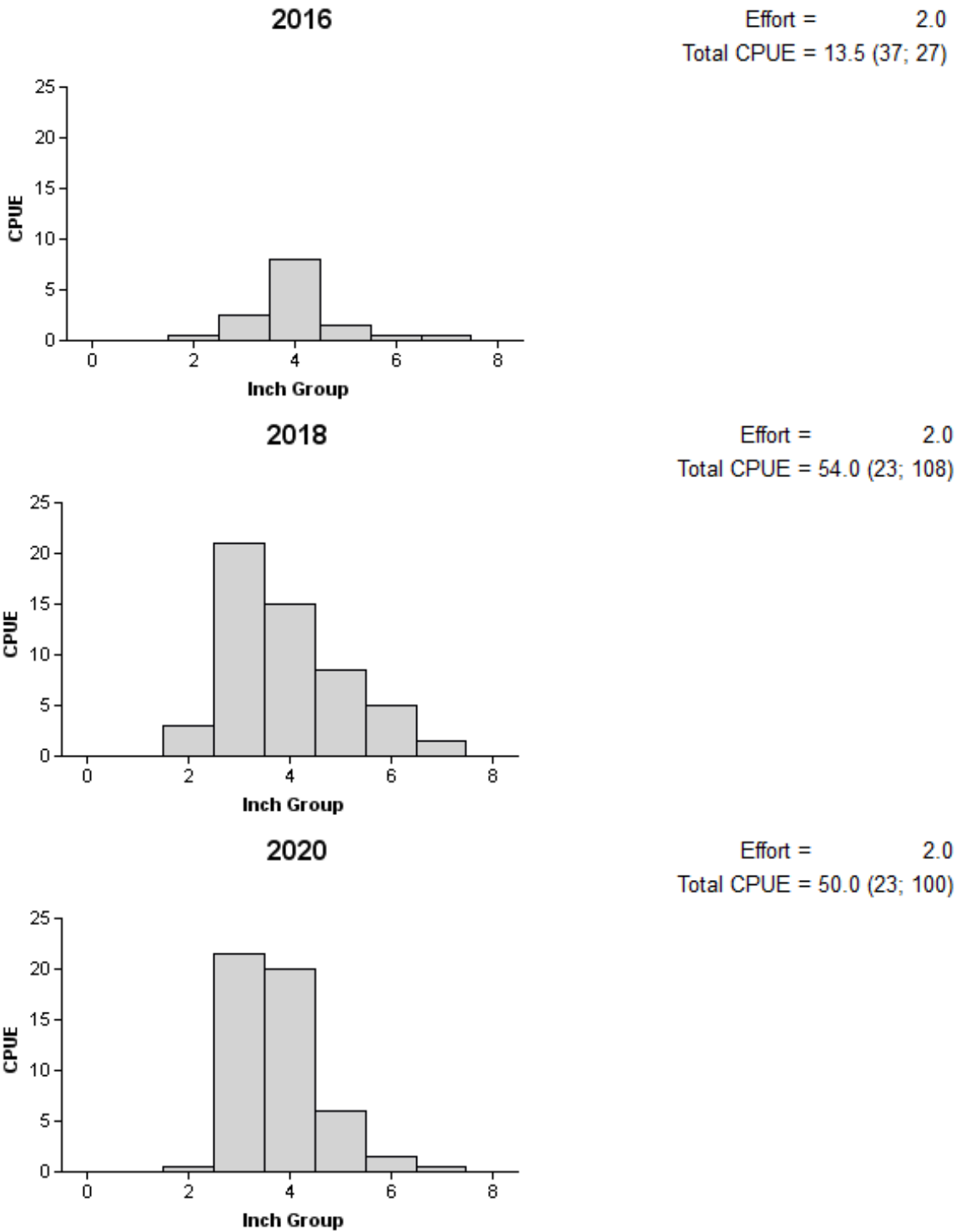


Figure 3. Number of Bluegill caught per hour (CPUE) for fall electrofishing surveys, Amistad Reservoir, Texas, 2016, 2018, and 2020. RSE and N for CPUE are in parentheses.

Redbreast Sunfish

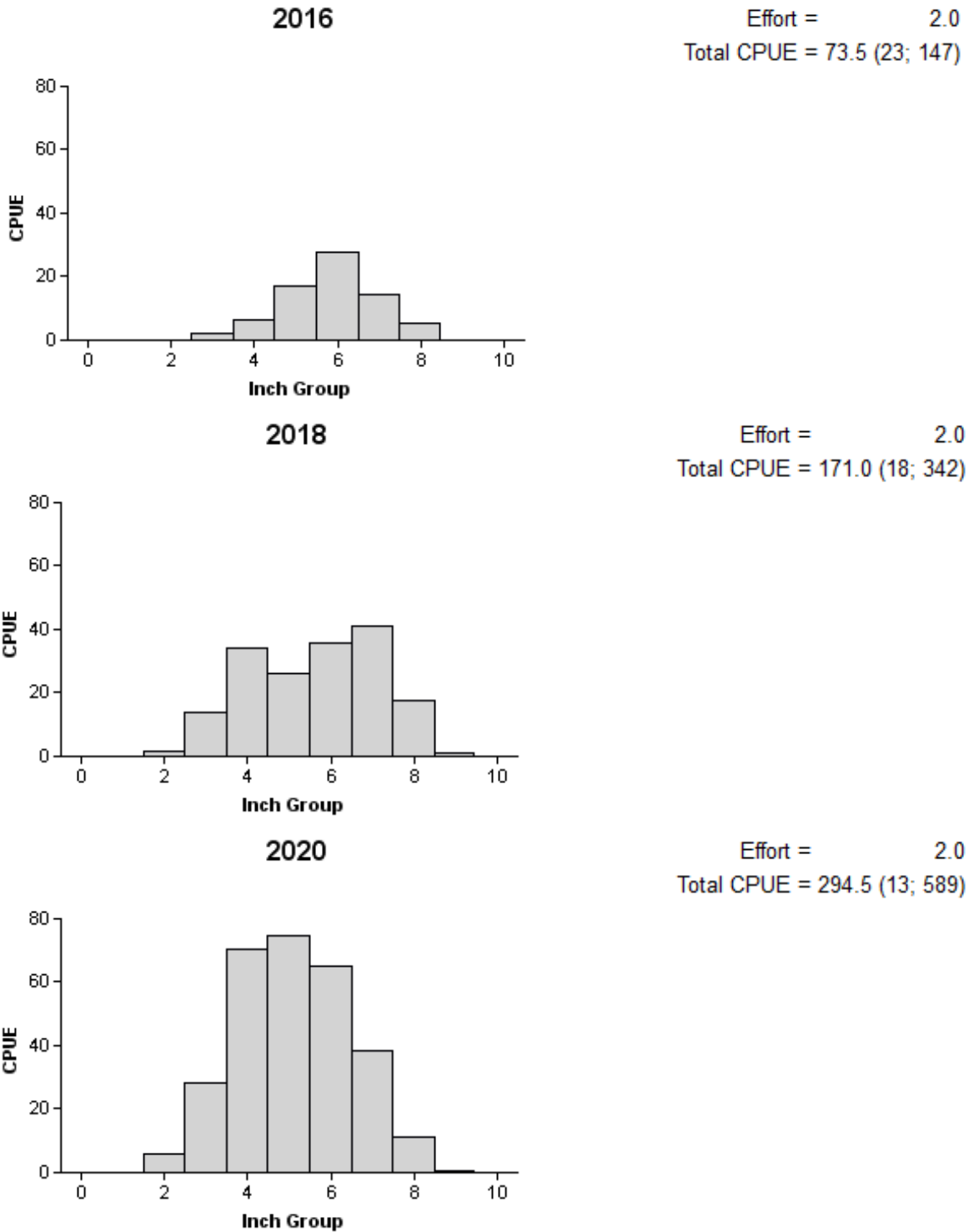


Figure 4. Number of Redbreast Sunfish caught per hour (CPUE) for fall electrofishing surveys, Amistad Reservoir, Texas, 2016, 2018, and 2020. RSE and N for CPUE are in parentheses.

Redear Sunfish

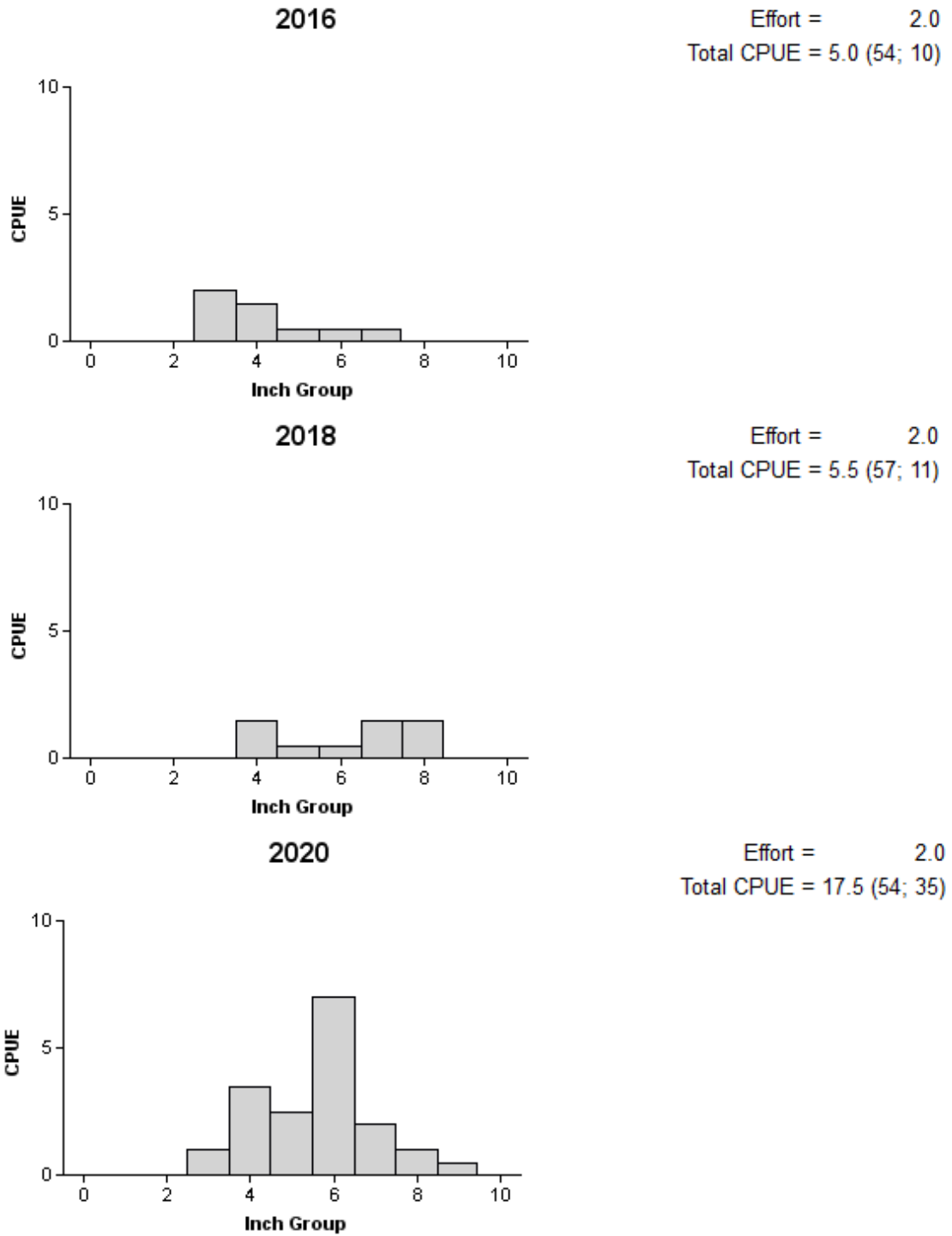


Figure 5. Number of Redear Sunfish caught per hour (CPUE) for fall electrofishing surveys, Amistad Reservoir, Texas, 2016, 2018, and 2020. RSE and N for CPUE are in parentheses.

Blue Catfish

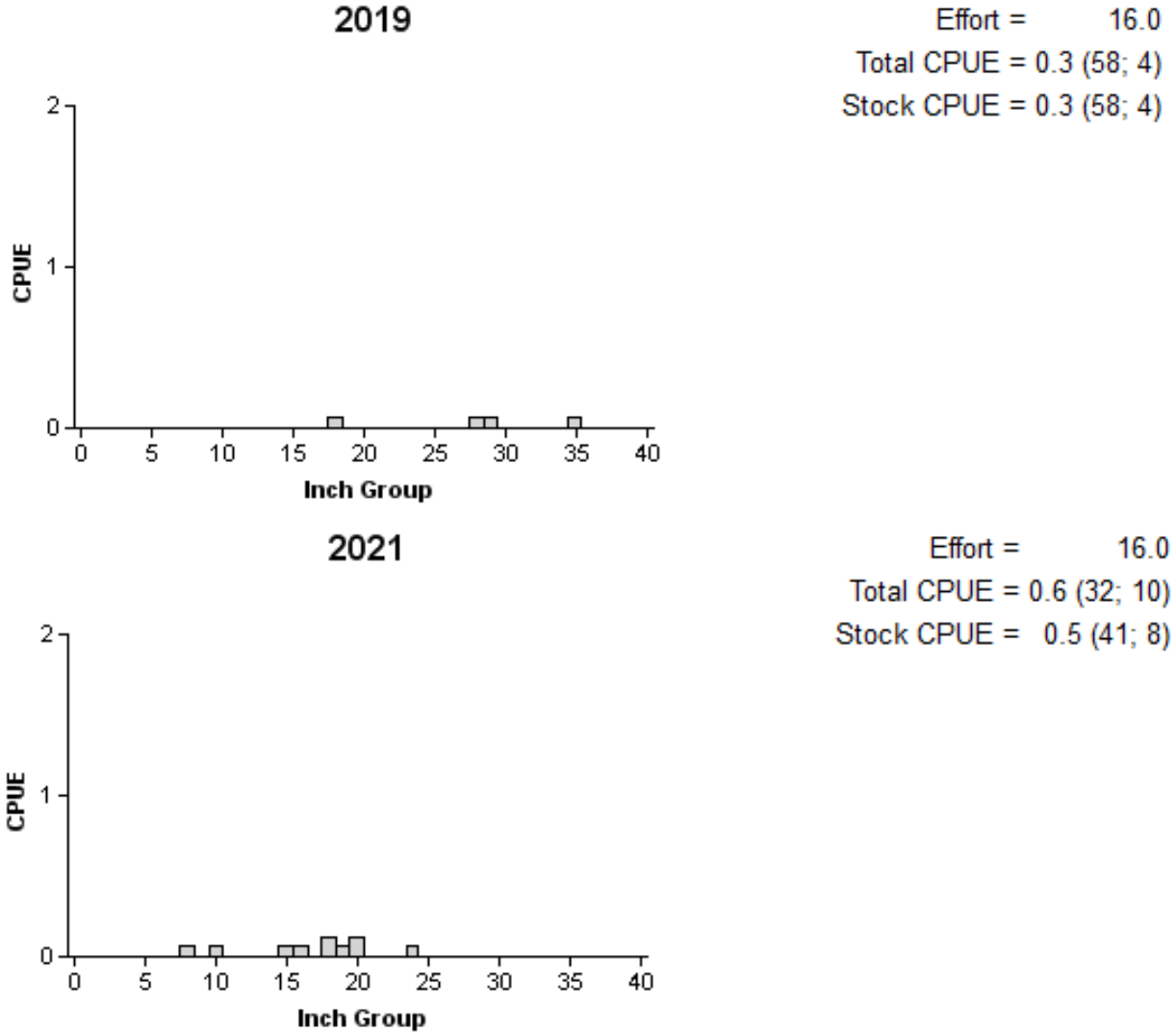


Figure 6. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Amistad Reservoir, Texas, 2019 and 2021. No Blue Catfish were collected during the 2017 spring gill net survey.

Channel Catfish

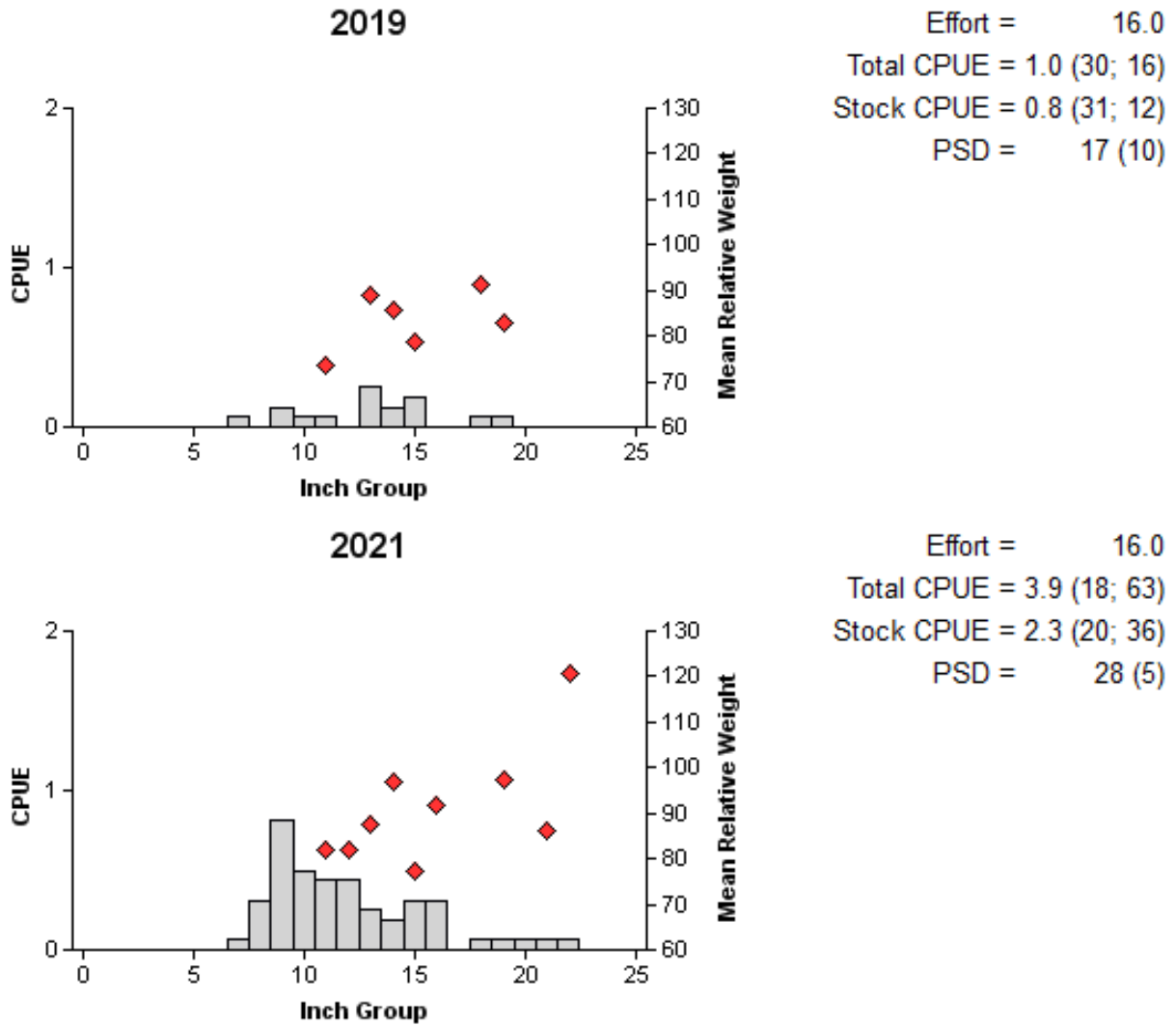


Figure 7. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Amistad Reservoir, Texas, 2019 and 2021. No Channel Catfish were collected during the 2017 spring gill net survey.

White Bass

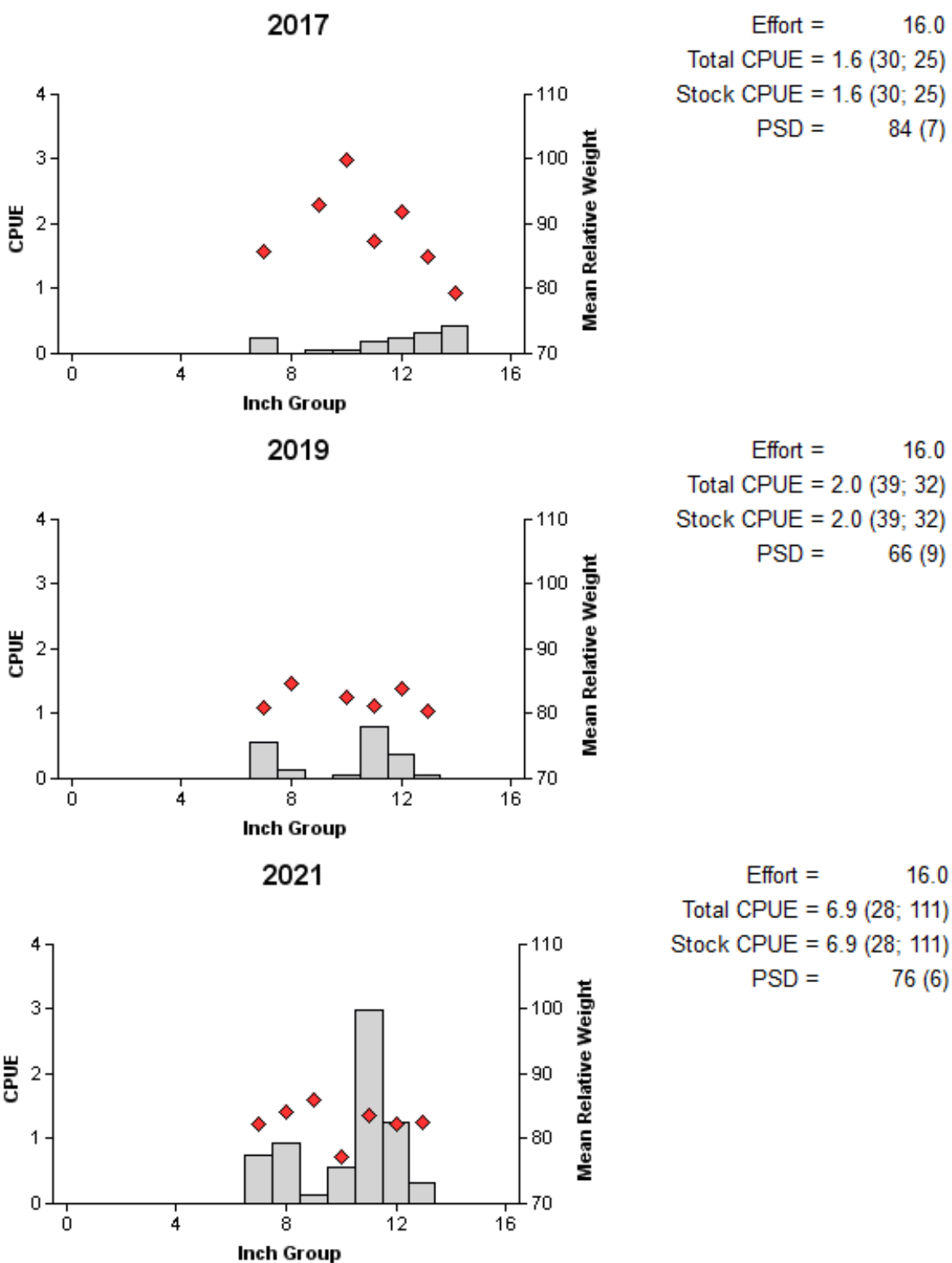


Figure 8. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Amistad Reservoir, Texas, 2017, 2019, and 2021.

Striped Bass

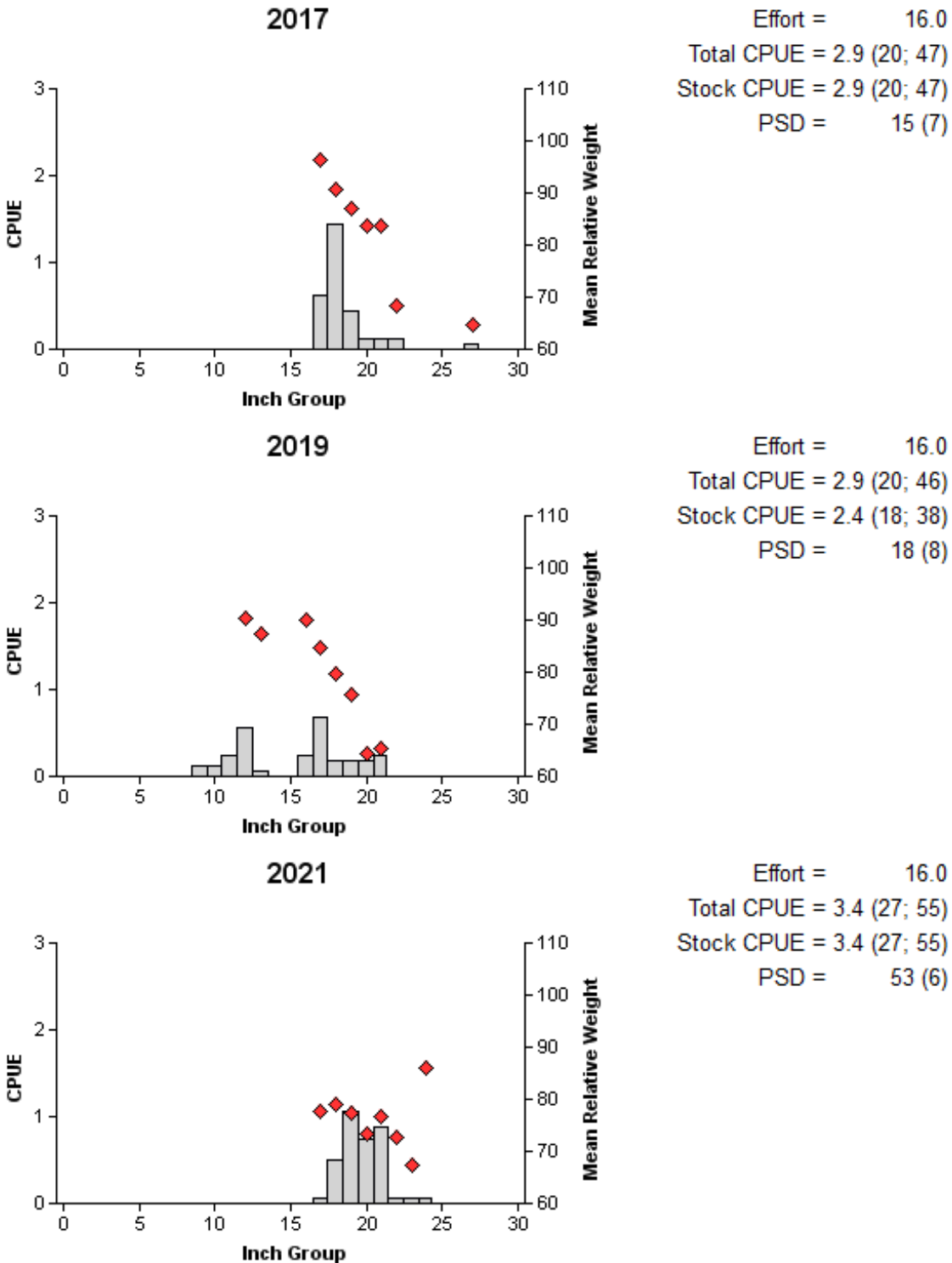


Figure 9. Number of Striped Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Amistad Reservoir, Texas, 2017, 2019, and 2021.

Largemouth Bass

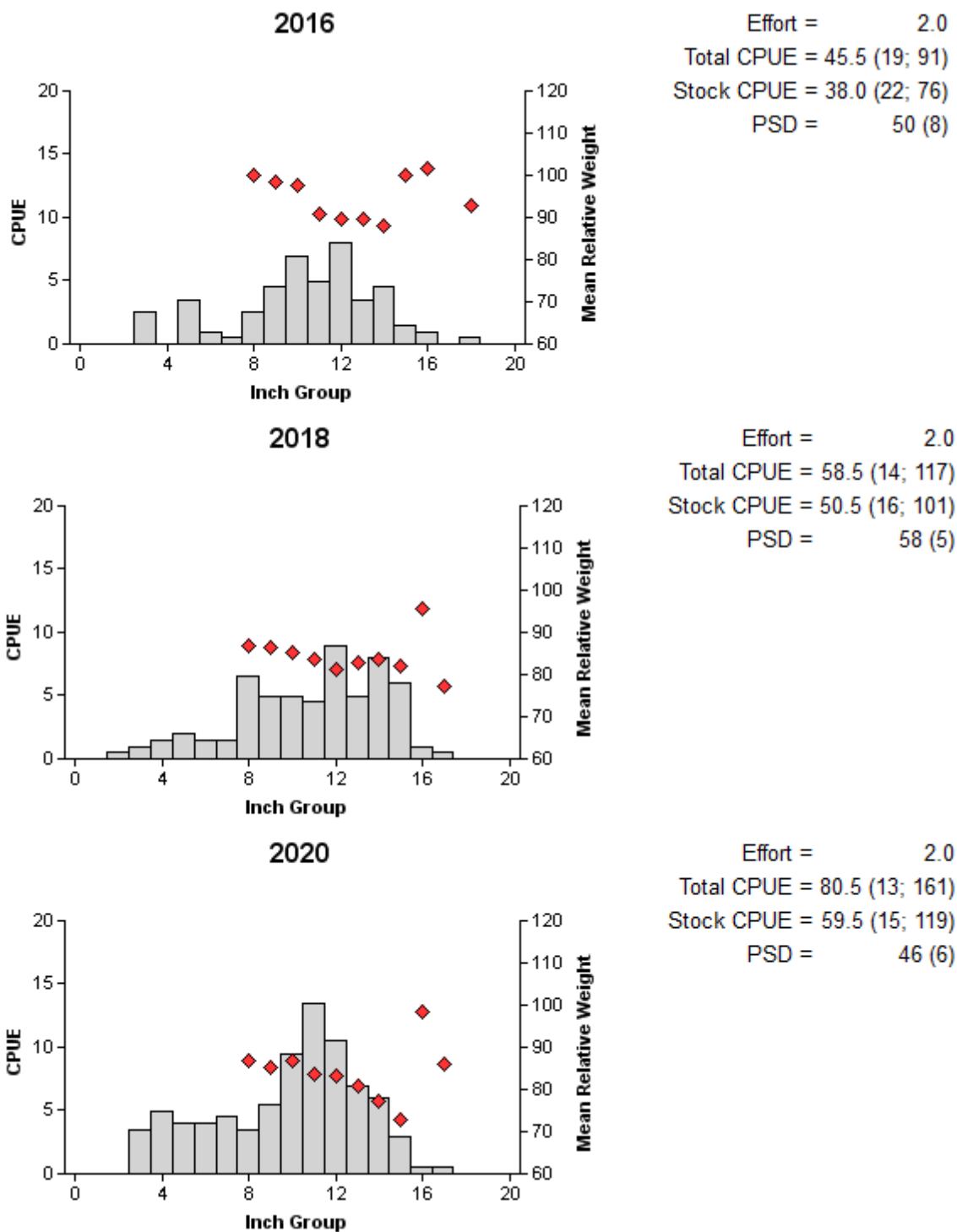


Figure 10. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure) for fall electrofishing surveys, Amistad Reservoir, Texas, 2011, 2016, and 2018.

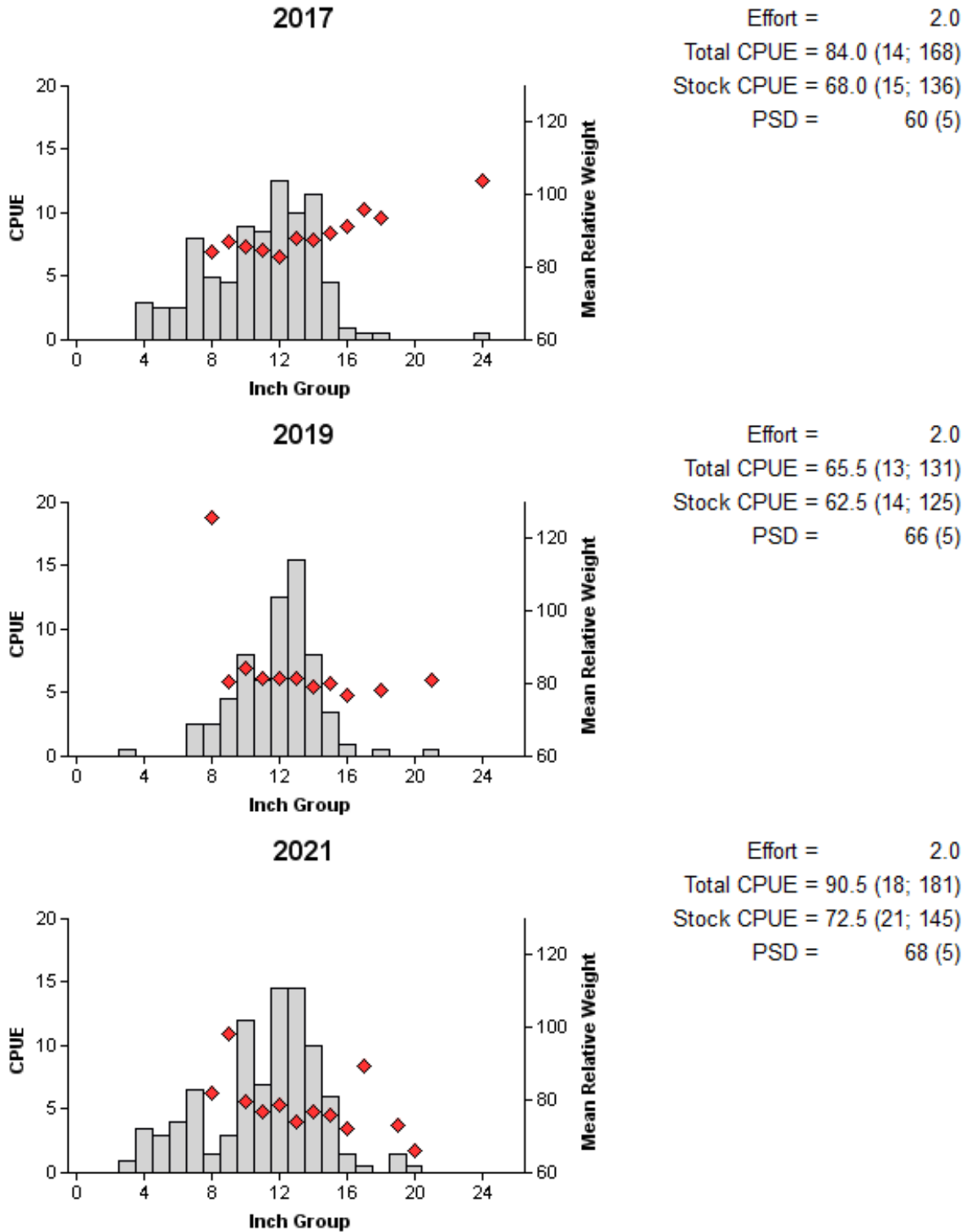


Figure 11. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Amistad Reservoir, Texas, 2017, 2019, and 2021.

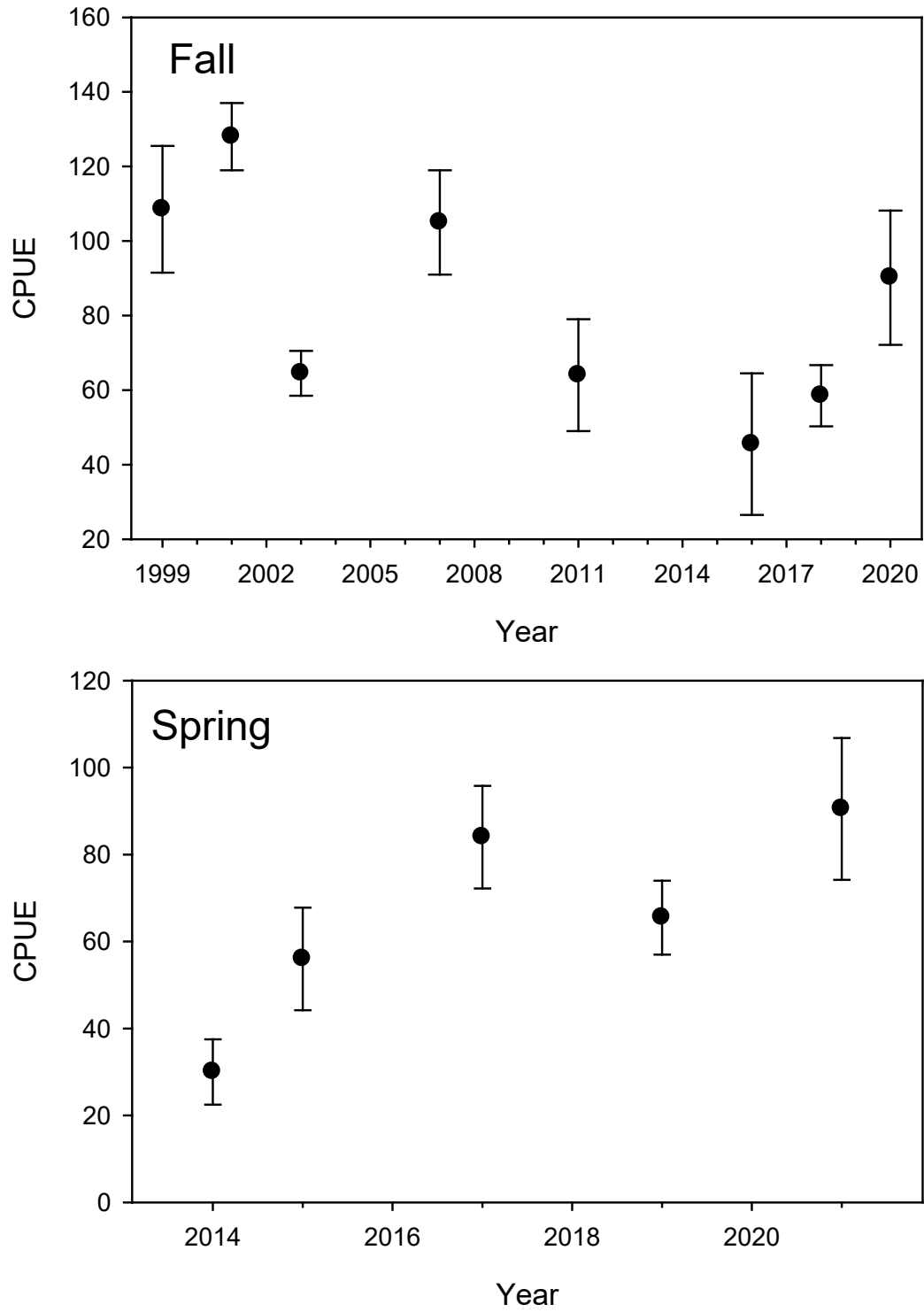


Figure 12. Average number of Largemouth Bass collected per 1 h of electrofishing effort (CPUE) at Amistad Reservoir, Texas, for fall (1999-2020) and spring (2014-2021) surveys. Error bars represent ± 1 standard error.

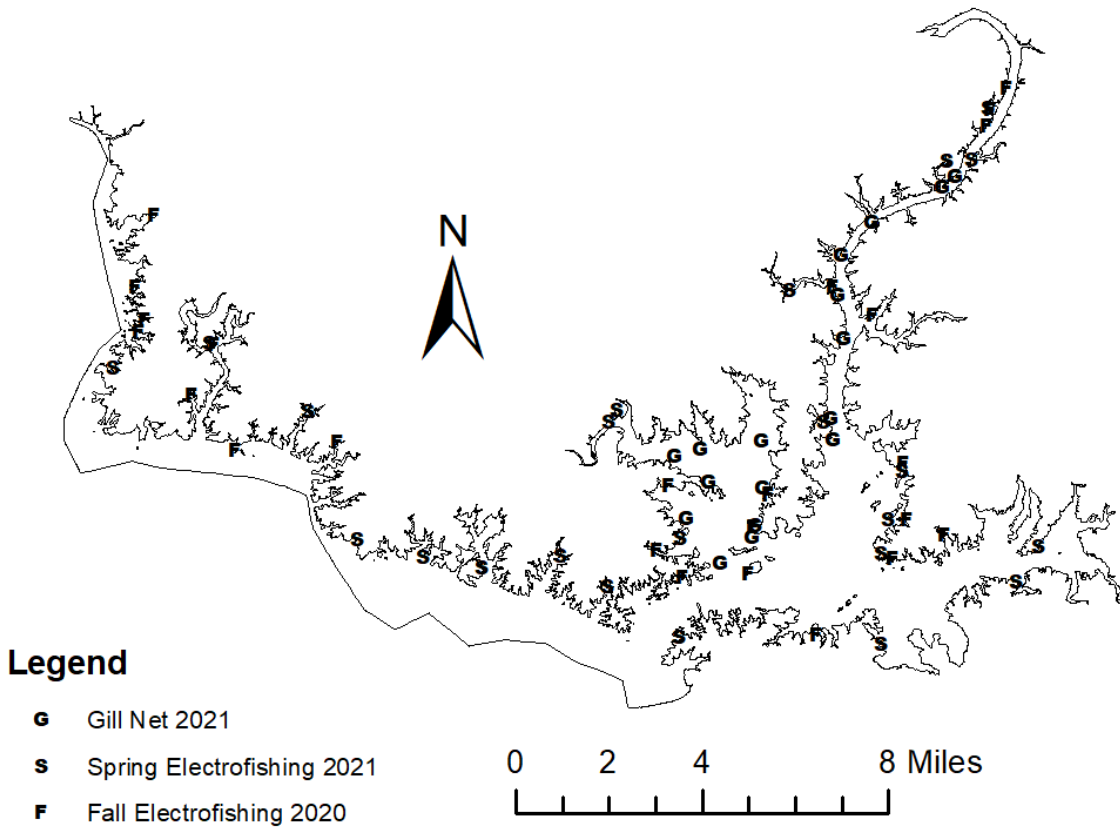
Table 7. Genetic analysis results for Largemouth Bass collected from Amistad Reservoir, Texas. Fish were collected using electrofishing. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined with micro-satellite DNA analysis.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2006	413	55	357	1	76.0	13.3
2009	30	7	23	0	82.0	23.3
2011	30	2	28	0	73.0	6.6
2016	30	5	25	0	83.0	16.6
2018	30	0	30	0	71.0	0.0
2020	29	1	28	0	68.0	3.0

Table 8. Proposed sampling schedule for Amistad Reservoir, Texas. Survey period is June through May. The creel surveys denoted for 2021-2022 will be conducted January-June 2022.

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

Appendix A – Map of Sampling Locations



Location of electrofishing and gill net sampling sites, Amistad Reservoir, Texas, 2020-2021. Fall and spring electrofishing sampling sites are indicated by “F” and “S,” respectively, and “G” denotes gill net sampling sites. Water level was 1073.7 feet above mean sea level (MSL) during fall electrofishing, 1071.9 feet above MSL during spring electrofishing, and 1072.1 feet above MSL during spring gillnetting.

Appendix B – Catch Rates for All Species and Gear Types

Number (N) and catch rate (CPUE), with relative standard error displayed in parenthesis, of all target species collected during electrofishing in fall 2020, and spring 2021, and gill netting in spring 2021. Sampling effort was two hours of electrofishing for fall and spring, and 16 net-nights of gill netting.

	Electrofishing				Gillnet	
	Fall		Spring		Spring	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad	173	86.5 (41)				
Threadfin Shad	12	6.0 (48)				
Mexican Tetra	2	1.0 (100)				
Redbreast Sunfish	589	294.5 (13)				
Green Sunfish	31	15.5 (33)				
Warmouth	1	0.5 (100)				
Bluegill	100	50.0 (23)				
Redear Sunfish	35	17.5 (54)				
Redspotted Sunfish	4	2.0 (78)				
Smallmouth Bass	43	21.5 (27)	7	3.5 (38)		
Largemouth Bass	161	80.5 (13)	181	90.5 (18)		
Spotted Gar					4	0.3 (58)
Longnose Gar					4	0.3 (77)
Common Carp					16	1.0 (58)
Gray Redhorse					2	0.1 (68)
Blue Catfish					10	0.6 (32)
Channel Catfish					63	3.9 (18)
Flathead Catfish					5	0.3 (48)
White Bass					111	6.9 (28)
Striped Bass					55	3.4 (27)
White Crappie					1	0.1 (100)
Black Crappie					20	1.3 (31)
Freshwater Drum					35	2.2 (42)



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.

© Texas Parks and Wildlife, PWD RP T3200-1236 (07/21)

TPWD receives funds from the USFWS. TPWD prohibits discrimination on the basis of race, color, religion, national origin, disability, age, and gender, pursuant to state and federal law. To request an accommodation or obtain information in an alternative format, please contact TPWD on a Text Telephone (TTY) at (512) 389-8915 or by Relay Texas at 7-1-1 or (800) 735-2989 or by email at accessibility@tpwd.texas.gov. If you believe you have been discriminated against by TPWD, please contact TPWD, 4200 Smith School Road, Austin, TX 78744, or the U.S. Fish and Wildlife Service, Office for Diversity and Workforce Management, 5275 Leesburg Pike, Falls Church, VA 22041.