

Ray Hubbard 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:

Raphael Brock, District Management Supervisor
and
Cynthia Holt and Thomas Hungerford, Assistant District Management Supervisors

Inland Fisheries Division
Dallas/Fort Worth District, Fort Worth, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

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Survey and Management Summary

Fish populations in Ray Hubbard Reservoir were surveyed in 2018 and 2020 using electrofishing and low frequency electrofishing, trap netting in 2020, and gill netting in 2019. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: Ray Hubbard Reservoir is a 22,745-acre impoundment constructed on the East Fork of the Trinity River by the City of Dallas in 1968 to provide water for municipal, industrial, and recreational purposes. Ray Hubbard Reservoir lies within Dallas, Collin, Rockwall, and Kaufman counties. The reservoir is part of the Dallas-Ft. Worth metroplex. The reservoir has a 1,074 square-mile watershed that lies in the Blackland Prairies ecological region. The reservoir is 13 miles long and 3 miles wide (widest point). It contains 452,040 acre-feet of water at conservation elevation (435.5 ft above mean sea level) and has a maximum depth of 40 feet. Bank and boat access are adequate. At the time of sampling the fishery habitat was primarily standing timber, native emergent vegetation, eroded banks, and rocky habitat in the form of riprap. Hydrilla (*Hydrilla verticillata*) is present and has historically provided fish habitat. However, for the last several years the Hydrilla coverage has been minimal.

Management History: Important sport fish include Largemouth Bass, crappie, White Bass, Hybrid Striped Bass, and Blue and Channel Catfish. All species are managed with statewide regulations. Hybrid Striped Bass are requested annually for stocking and provide a popular fishery. The reservoir has a population of large Blue Catfish and has produced ShareLunker Largemouth Bass. Florida Largemouth Bass were stocked frequently from 2013-2015.

Fish Community

- **Prey species:** Threadfin Shad were present and catch rate was lower than historic average. Gizzard Shad were also present in good abundance although lower than historical average. Bluegill and Longear Sunfish were also abundant as prey. Bluegill over 6 inches are available for anglers.
- **Catfishes:** The Blue Catfish population continued to be excellent with large individuals available for anglers. The relative abundance of Channel Catfish has gone down from previous survey. No flathead catfish were sampled during annual gill netting but are present.
- **Temperate basses:** White Bass catch rates were lower than the previous survey. Hybrid Striped Bass catch rate was low when compared to previous surveys.
- **Largemouth Bass:** The Largemouth Bass catch rate was higher than the past several surveys with good size structure. Catch rate of fish ≥ 14 was high.
- **Crappie:** The White Crappie population catch rate was lower when compared to previous survey. Black Crappie catch rates increased.

Management Strategies: Ray Hubbard Reservoir has a popular Hybrid Striped Bass fishery, and quality Largemouth Bass and Blue catfish populations. Maintaining the Hybrid Striped Bass fishery requires annual stockings. Hybrid Striped Bass will be requested for stocking annually with alternating years of fry and fingerlings. An annual creel survey and intensive gill netting will be conducted in 2022-2023 as part of a special research project to evaluate Sunshine/Palmetto Bass stocking success. This will also provide updated catch rates and angler use rates of all species. An additional fall electrofishing survey and spring gillnetting survey will be conducted to monitor Largemouth Bass, Blue Catfish, and Hybrid Striped Bass populations. Florida Largemouth Bass will also be requested for stocking because of the reservoir history of producing trophy Largemouth Bass. The Blue Catfish regulation will change to no minimum length limit 25 fish bag limit with only 5 fish allowed over 20 inches and only one allowed over 30 inches. This change will occur on September 1, 2021. This regulation will be implemented to maintain the trophy Blue Catfish population in the Reservoir. Annual exotic vegetation surveys will be conducted to monitor hydrilla abundance.

Introduction

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

Reservoir Description

Ray Hubbard Reservoir is a 22,745-acre impoundment constructed on the East Fork of the Trinity River by the City of Dallas in 1968 to provide water for municipal, industrial, and recreational purposes. Ray Hubbard Reservoir is located one mile east of Rockwall and lies within Dallas, Collin, Rockwall, and Kaufman counties. The reservoir is surrounded by urban development and is part of the Dallas-Ft. Worth metroplex. The reservoir has a 1,074 square-mile watershed that lies in the Blackland Prairies ecological region and is primarily used for agricultural and residential development. The reservoir is 13 miles long and 3 miles wide (widest point). It contains 490,000 acre-feet of water at conservation elevation (435.5 ft above msl) and has a maximum depth of 40 feet. It is classified as eutrophic by the Texas Commission on Environmental Quality (Texas Commission on Environmental Quality 2020). At the time of sampling the fishery habitat was primarily standing timber, native emergent vegetation, and rocky habitat in the form of riprap. Hydrilla (*Hydrilla verticillata*) is present in very low abundance. Annual water levels have fluctuated less than 4 feet the past six years (Figure 1). Other reservoir characteristics are in Table 1.

Angler Access

Ray Hubbard Reservoir has eight public boat ramps, one of which is for small craft only. Several public ramps were lost due to sale of Robertson Park by the City of Dallas to private developers. Additional boat ramp characteristics are in Table 2. The small vessel ramp in Paddle Point Park is associated with a TPWD paddling trail. Shoreline fishing access can be found at Bob Jones Park, Ray Hubbard Green Belt, Wind Surf Bay Park, Terry Park, Barnes Bridge Park, Lakeside Park South, and the Hwy 66 boat ramp.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Brock, Hungerford, and Holt 2017) included:

1. A quality fishery for Hybrid Striped Bass has persisted in Ray Hubbard Reservoir since the stocking program began in 1976. The fishery supports several guides targeting Hybrid Striped Bass. Maintenance of the population relies on annual stockings and age and growth analysis. The reservoir is also part of a statewide Hybrid Striped Bass research project. Request Hybrid Striped Bass fingerlings as outlined in research project. Collect fish from guide services to supplement age and growth sample. Develop fishing log for guide services to aid in Hybrid Striped Bass population evaluation

Action: Hybrid Striped Bass fingerlings were requested and stocked as required of special research project. Updated Ray Hubbard Sportmen's Association regarding Hybrid stockings. Several attempts were made to collect fish from guide service, but none were obtained, and we were not able to supplement age and growth samples for Hybrid Striped Bass. After internal district discussions and consultation with a guide, development of fishing log was postponed due to the complexity of required fishing log details and how to maintain data quality.
2. A quality fishery for Blue Catfish persists in Ray Hubbard Reservoir. Gill net sampling has resulted in adequate sampling statistics to monitor changes in the population. However, gill netting may not be the most efficient method of sample collection when maintenance and man hours are included in determining sample efficiency. Conduct summer low-frequency

electrofishing (LFE) in 2018 and 2020 to determine if adequate sampling statistics can be obtained when compared to gill net sampling.

Action: Low frequency electrofishing was conducted in 2018 and 2020.

3. The exotic vegetation Hydrilla is present in Ray Hubbard Reservoir and its abundance is variable from year to year. It has never caused access problems and no treatment plan has ever been developed for control. Conduct exotic vegetation surveys annually to monitor Hydrilla.

Action: Annual exotic vegetation surveys were conducted from 2017-2020.

4. The invasive species zebra mussels (*Dreissena polymorpha*) are a big threat to Ray Hubbard Reservoir. It is currently classified as a “suspect” zebra mussel reservoir.

Action: Communicated with controlling authority and local municipalities regarding invasive species information and provided educational materials when requested. Zebra mussel boat ramp stamps were also inspected and repaired if necessary.

Harvest regulation history: Sport fish populations in Ray Hubbard Reservoir have been managed with statewide regulations (Table 3). The Blue Catfish regulation will change to no minimum length limit 25 fish bag limit with only 5 fish allowed over 20 inches and only one allowed over 30 inches. This change will occur on September 1, 2021. This regulation will be implemented to maintain the trophy Blue Catfish population in the Reservoir.

Stocking history: Ray Hubbard Reservoir has been stocked frequently with Florida Largemouth Bass and Hybrid Striped Bass. The complete stocking history is in Table 4.

Vegetation/habitat management history: No habitat management projects have been conducted on the reservoir. Exotic vegetation surveys have been conducted annually to monitor Hydrilla. Recent Hydrilla abundance has been minimal. Even at its highest abundance, Hydrilla has never hampered access or cause problems with reservoir users. During sampling, littoral zone habitat consisted primarily of rocky and natural shoreline.

Zebra mussels: The exotic species zebra mussels have been found in several DFW area reservoirs including Ray Hubbard Reservoir. Ray Hubbard is downstream of Lavon Reservoir which had zebra mussels in a tributary. Ray Hubbard Reservoir is currently listed as suspect. This means zebra mussels, or their larvae have been detected on one occasion.

Water transfer: Ray Hubbard Reservoir is primarily used as water supply for the City of Dallas. No interbasin transfers exist.

Methods

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

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.8 hours at 22, 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.

Trap netting – Crappie were collected using trap nets (15 net nights at 15 stations). Catch per unit effort for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting – Blue Catfish, Channel Catfish, White Bass, and Hybrid Striped Bass were collected by gill netting (15 net nights at 15 stations). Catch per unit effort for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for Hybrid Striped Bass were determined using otoliths.

Low Frequency Electrofishing – Blue Catfish were collected by low frequency electrofishing (2.0 hours at 24, 5-min stations). Catch per unit effort for low frequency electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Genetics – Genetic analysis of Hybrid Striped Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

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 structural habitat survey was conducted in 2020. Survey was conducted using the random point method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Water level – Source for water level data was the United States Geological Survey (USGS 2020).

Results and Discussion

Habitat: A habitat survey was conducted in 2020. The most dominate shoreline structure was natural, bulkhead, and rock. The results are in Table 6. With continued land development around the reservoir, bulkheading will probably increase in the future.

Prey species: The 2020 electrofishing catch rate of Threadfin Shad (264.6/h) was higher than the previous survey but lower than the reservoir average (Appendix A and C). The Gizzard Shad electrofishing catch rate in 2020 (190.3/h) was much lower than the previous samples (Figure 2). Index of vulnerability for Gizzard Shad (80) was higher when compared to the previous sample (Figure 2). This indicated that 80% of Gizzard Shad captured in 2020 were available as forage. It was observed that many smaller shad could not be captured because they were too small for the mesh size on sample collection nets. The electrofishing catch rate of Bluegill in 2020 (222.3/h) was slightly lower than the previous sample and higher than reservoir average (Figure 3; Appendix C). The most recent survey revealed some larger sunfish available for anglers as the CPUE-6 of Bluegill (72.6/h) was higher than the previous sample (Figure 3). The Longear Sunfish catch rate observed in 2020 (72.0/h) was lower than previous

sample and lower than reservoir average (Appendix A and C). The OBS sampling objectives were achieved for Bluegill and Gizzard Shad

Catfishes: The gill net catch rate of Blue Catfish in 2019 was 5.1/nn and was the slightly lower than previous sample (Figure 4). PSD decreased from previous sample while PSD-P remained relatively the same. Low frequency electrofishing (LFE) for Blue Catfish began in summer of 2018 and continued in 2020. The catch rates for this period was 84.5/h and 99.0/h respectively (Figure 5). LFE proved to be an effective method for catching Blue Catfish but was more variable when compared to gill netting. Only gill netting will be used to sample the Blue Catfish population in the future. The gill net catch rate of Channel Catfish was lower in 2019 (1.9/nn) than previous sample (Figure 6).

Temperate Bass: The gill netting catch rate of White Bass in Ray Hubbard Reservoir increased from the previous sample (Figure 7) but are highly variable historically. Hybrid Striped Bass gill netting catch rate in 2019 was 1.3/nn which is similar to previous sample but lower than the historical average (Figure 8; Appendix C). Age and growth revealed good growth with fish reaching legal size between age 2 and 3 (Figure 9). Genetic analysis revealed 16 of the hybrids caught were Palmetto Bass while only 1 was a Sunshine Bass. No gillnet sampling occurred in 2020.

Largemouth Bass: Largemouth Bass total electrofishing catch rate in 2019 (158.0/h) was higher than previous sample (Figure 10). The catch rate of Largemouth Bass \geq 14 inches also increased from the previous survey (Figure 10). Size structure was skewed towards larger fish in 2020 (Figure 10). No genetic sampling was performed, but previous testing revealed a high Florida Largemouth Bass (FLMB) influence (Table 7).

Crappie: The trap net catch rate of White Crappie was 1.1/nn in 2020 and was lower than the previous sample (Figure 11). The body condition (W_r) of the White Crappie population was good with most inch classes at or above 90. The trap net catch rate of Black Crappie was 6.1/nn which was lower than previous sample (Figure 12). The Black Crappie catch rate of fish over 10 inches (1.1/nn) remained unchanged from the previous survey.

Fisheries Management Plan for Ray Hubbard Reservoir, Texas

Prepared – July 2021

ISSUE 1: A quality fishery for Hybrid Striped Bass has persisted in Ray Hubbard Reservoir since the stocking program began. Annual stockings are required to maintain the fishery. The fishery supports several guides targeting Hybrid Striped Bass. Maintenance of the population relies on annual stockings. The Ray Hubbard Sportmen's Association have also raised funds to purchase Sunshine Bass for supplemental stocking. Ray Hubbard is also part of a special research project to evaluate Palmetto and Sunshine Bass stockings.

MANAGEMENT STRATEGIES

1. Request annual stockings of Hybrid Striped Bass fingerlings.
2. Continue to develop partnership with the Ray Hubbard Sportmen's Association.
3. Collect fish from guide services to supplement age and growth sample as needed.
4. Monitor population through completion of special research project with intensive gillnetting effort in 2023. Conduct standard gillnet survey in 2025
5. Update angler catch rate and effort with creel survey as part of special research project in 2022-2023.

ISSUE 2: Based on the last creel information, Largemouth Bass are the most sought-after species in the reservoir. Ray Hubbard has historically produced quality Largemouth Bass. In 2020, 4 fish ranging in size from 8.62-10.45 lbs. were submitted to the ShareLunker program. Thus far in 2021, 3 Largemouth Bass have been submitted to the ShareLunker program with fish ranging in size from 9.52-9.79 lbs. Additional sampling is needed to monitor the population.

MANAGEMENT STRATEGIES

1. Conduct additional fall electrofishing in 2022 to monitor Largemouth Bass population.
2. Request FLMB for stocking at 1,000/km of shoreline.

ISSUE 3: The regulation on Blue Catfish will be change from 12 minimum; 25 fish bag limit, to no minimum length limit 25 fish bag limit with only 5 fish allowed over 20 inches and only one allowed over 30 inches.

MANAGEMENT STRATEGIES

1. Monitor feedback from anglers concerning new regulation.
2. Monitor population thru additional gillnetting.

ISSUE 4: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive

vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc. so that they can, in turn, educate their customers.
3. Educate the public about invasive species using 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.
6. Conduct exotic vegetation surveys annually to monitor Hydrilla.

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

Sport fish, forage fish, and other important fishes:

Important sport fishes in Ray Hubbard Reservoir include Largemouth Bass, Channel and Blue Catfish, White Bass, Hybrid Striped Bass and White Crappie. Known important forage species include Bluegill, Longear Sunfish, Threadfin and Gizzard Shad.

Low density fisheries:

Flathead Catfish: Flathead Catfish are present in Ray Hubbard Reservoir, however, they are rarely captured in gill nets. Data on CPUE and size structure data will be recorded from all Flathead Catfish collected by gill nets targeting catfishes, and temperate bass.

Survey objectives, fisheries metrics, and sampling objectives

Ray Hubbard Reservoir has been chosen to take part in an evaluation of the stocking of Palmetto and Sunshine Bass. The final procedures for the project have not been determined. Thus, objectives listed below could change based on project procedures.

Creel Survey: A 36-day annual creel survey will be conducted from June 2022-May 2023. The creel results will provide updated angling trends for the reservoir.

Catfishes: Catfishes are the second most sought-after sport fish in Ray Hubbard Reservoir (16% of total angling effort; creel conducted 2004-2005). It is currently not known what percentage of catfish anglers target Blue Catfish and what percentage target Channel Catfish. However, based on observations of angler effort trends on other district reservoirs, more of the effort is probably directed toward Blue Catfish. The popularity and reputation for quality catfish fishing at this reservoir warrant sampling time and effort. Catfish will be collected during gill net surveys as part of the special Hybrid Striped Bass project in 2022-2023. The current plan is to conduct a gill net survey consisting 30 net nights. An additional 15 gill net survey will be conducted in 2024-2025. Survey information on both catfish species will be collected to determine CPUE and size structure. This information should be adequate to make management decisions. No sampling objectives will be set for catfish.

Temperate Basses: The popularity and reputation for quality White Bass and Hybrid Striped Bass fishing at this reservoir warrant sampling time and effort. Previous creel survey data indicated 11% of anglers targeted White Bass. Although angler effort is high for the species, no sampling objectives will be set for White Bass because of the variability in year class strength of the population. Data on White Bass will be collected when gill net surveys are conducted in 2023 and 2025. This should give an idea of the population status when compared to past surveys. Hybrid Striped Bass are a popular sport fish in Ray Hubbard even though the latest creel conducted in 2004-2005 revealed only 2% directed effort towards Hybrid Striped Bass. Gill net surveys consisting of 30 and 15 gill nets will be conducted in 2023, and 2025 respectively. Because of the historically high variability of gillnetting catch rate data for Hybrid Striped Bass, no sampling objective will be set for CPUE. Otoliths and fin clips will be collected from hybrids sampled in 2023 and 2025. Otoliths will be aged, and fins analyzed to determine if the hybrids are Sunshine Bass or Palmetto Bass.

Largemouth Bass: According to the most recent creel survey conducted on Ray Hubbard Reservoir (2004-2005), 24% of anglers target Largemouth Bass and they are the most popular sport fish in Ray Hubbard Reservoir. The popularity and reputation for quality Largemouth Bass fishing at this reservoir warrant sampling time and effort. Trend data on CPUE, size structure, and body condition have been collected annually from 2004-2015 with fall nighttime electrofishing. To continue monitoring of Largemouth Bass, fall nighttime electrofishing will be conducted. A minimum of 22 randomly selected 5-min electrofishing sites will be sampled in fall of 2022 and 2024. Based on past catch rates, this should be adequate to obtain an RSE of CPUE-S < 25 (the anticipated effort to meet both sampling objectives is

24 stations with 80% confidence). If the RSE objective is not met, two additional electrofishing stations will be sampled to achieve RSE objective or if 50 stocked sized fish or larger are not captured in the 22 sample sites for size structure determination (PSD; 50 fish minimum at 24 stations with 80% confidence).

Prey Species: Bluegill, Longear Sunfish, Threadfin, and Gizzard Shad are the primary forage in Ray Hubbard Reservoir. Like Largemouth Bass, trend data on CPUE and size structure have been collected with fall nighttime electrofishing. Sampling, as with Largemouth Bass above, will allow for monitoring of large-scale changes in Bluegill, Longear Sunfish, Threadfin and Gizzard Shad relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers of Bluegill, Longear Sunfish, Threadfin and Gizzard Shad for size structure estimation (PSD for sunfish species; IOV for Gizzard Shad; 50 fish minimum at 24 stations with 80% confidence).

Crappie: Previous creel survey data indicate White crappie angling comprised 12% of total angling effort. In recent surveys, black crappie have increased greatly. A 15 single-cod shoreline trap netting survey will be conducted in fall of 2024 to monitor catch rate and size structure. This should provide sufficient information for monitoring of large-scale changes of population.

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Tables and Figures

Figure 1. Water level elevations in feet above mean sea level (MSL) recorded for Ray Hubbard Reservoir, Texas, April 2013- March 2021. Conservation pool (435.5 MSL) is noted with broken black line.

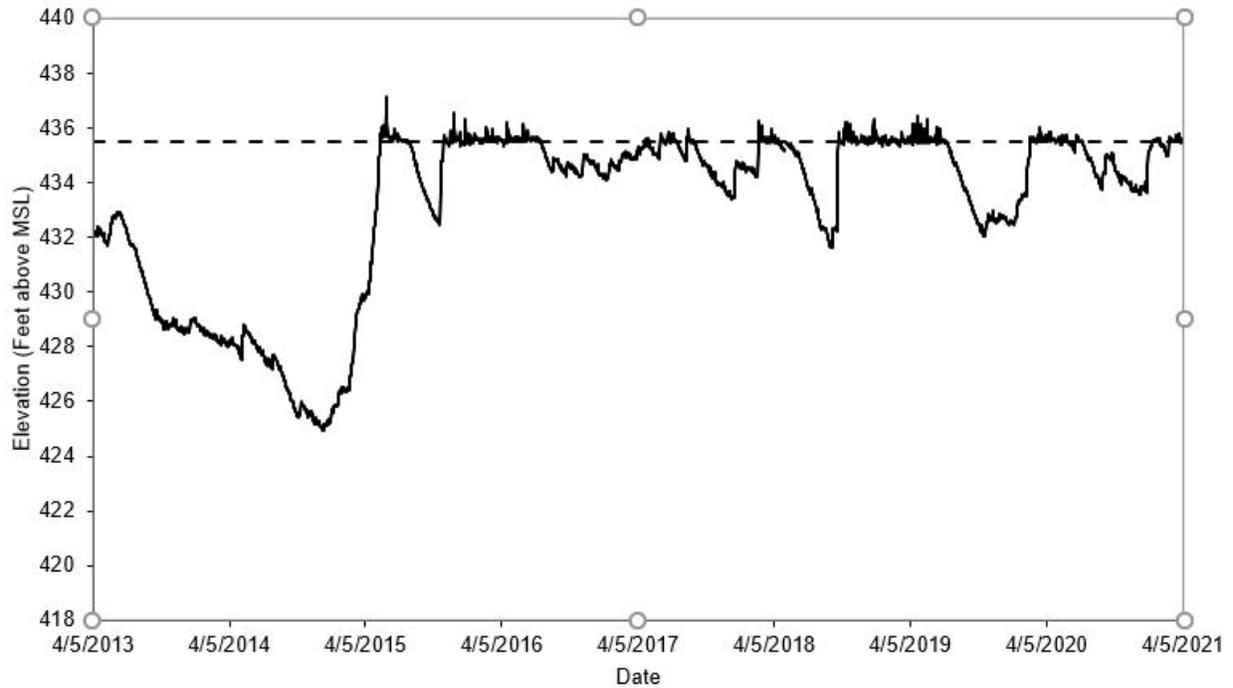


Table 1. Characteristics of Ray Hubbard Reservoir, Texas.

Characteristic	Description
Year constructed	1968
Controlling authority	United States Army Corps of Engineers
Counties	Collin, Dallas; Rockwall; Kaufman
Reservoir type	East Fork of Trinity River
Conductivity	290.4 $\mu\text{S}/\text{cm}$

Table 2. Boat ramp characteristics for Ray Hubbard Reservoir, Texas, August 2020. Boat ramp closed due to private development is highlighted.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
John Paul Jones Park	32.867 -96.573	Y	35	427.8	Good. No courtesy dock
Captains Cove Marina	32.856 -96.545	Y	80	428.8	Good
Terry Park	32.8395 -96.50616	Y	50	430.1	Good. Poor courtesy dock
Chandlers Marina	32.876 -96.4825	Y	150	422.9	Good
Robertson Park South - West	32.8725 -96.5218	Y	50	428.1	Adequate. No courtesy dock
Robertson Park South - East	32.8755 -96.51467	Y	50	NA	Adequate. No courtesy dock
Harbor Bay Marina	32.8966 -96.4816	Y	280	426.7	Good
Hwy 66 Boat Ramp	32.9295 -96.474	Y	100	428.3	Good
Paddle Point Park	32.8924 -96.5367	Y	25	NA	Good. Gravel ramp for small craft only

Table 3. Harvest regulations for Ray Hubbard 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 Bass	5	18-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Ray Hubbard, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1990	109,175	FGL	2.0
	1993	399,958	FGL	2.2
	Total	509,133		
Channel Catfish	1971	96,830	AFGL	7.9
	Total	96,830		
Florida Largemouth Bass	1988	64,872	FRY	1.0
	1991	568,891	FGL	1.4
	1996	549,328	FGL	1.4
	2001	501,365	FGL	1.6
	2003	5,000	FGL	1.5
	2006	542,236	FGL	1.7
	2007	543,441	FGL	1.7
	2010	520,551	FGL	1.7
	2011	511,897	FGL	1.6
	2012	573,599	FGL	1.6
	2013	502,264	FGL	1.6
	2014	433,353	FGL	1.8
	2015	133,112	FGL	1.6
Total	5,449,909			
Largemouth Bass	1968	1,471,600	FRY	0.7
	1970	2,003,000	FRY	0.7
	1970	201,000	UNK	0.0
	Total	3,675,600		
Mixed Largemouth Bass	1988	502,897		0.9
	Total	502,897		
Palmetto Bass (female Striped X male White Bass hybrid)	1976	149,616	UNK	0.0
	1979	114,000	UNK	0.0
	1980	101,800	UNK	0.0
	1982	232,701	UNK	0.0
	1985	271,952	FGL	2.0
	1987	455,017	FRY	1.0
	1988	1,200	AFGL	4.0
	1988	454,647	FRY	1.0
	1989	460,946	FGL	1.3
	1991	235,994	FGL	1.4

Table 4. Stocking history continued.

Species	Year	Number	Life Stage	Mean TL (in)
Palmetto Bass (female Striped X male White Bass hybrid)	1992	325,185	FGL	1.4
	1993	171,853	FGL	1.6
	1993	940,000	FRY	0.4
	1994	170,027	FGL	1.7
	1994	171,634	FRY	0.9
	1995	346,142	FGL	1.2
	1996	250,702	FGL	1.6
	1999	56,945	FGL	1.3
	2002	172,336	FGL	1.3
	2003	162,993	FGL	1.5
	2004	100,438	FGL	1.3
	2005	216,814	FGL	1.5
	2005	1,501,902	FRY	0.3
	2007	152,637	FGL	1.5
	2008	114,846	FGL	1.6
	2009	107,290	FGL	1.4
	2011	105,118	FGL	1.3
	2013	2,074,929	FRY	0.2
	2014	88,552	FGL	1.6
	2015	1,313,287	FRY	0.2
	2016	103,070	FGL	1.6
2017	227,550			
2018	173,876			
2019	89,674			
Total	11,615,673			
Striped bass	1979	111,225	UNK	0.0
	1981	113,482	UNK	0.0
	1983	115,868	UNK	0.0
	1984	338,680	FGL	2.0
	1986	50,800	FGL	2.0
	1986	174,400	FRY	1.0
	1996	11,598	FGL	1.7
	Total	916,053		
Sunshine Bass (male White Bass x female Striped Bass hybrid)	2013	45,000	FGL	UNK
	2014	93,011	FGL	1.4
	2015	45,000	FGL	UNK
	2017	26,686		
	2018	159,900		
	2019	92,156		
	2021	594,964	FRY	
Total	1,056,717			
Walleye	1976	230,000	FRY	0.2
	1981	19,237	FRY	0.2
	Total	249,237		

Table 5. Objective-based sampling plan components for Ray Hubbard Reservoir, Texas 2020–2021.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	None
Bluegill ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	IOV, length frequency	$N \geq 50$
<i>Trap netting</i>			
Crappie	Abundance	CPUE	None
	Size structure	PSD, length frequency	None
	Condition	W_r	None
<i>Gill netting</i>			
Blue Catfish	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	10 fish/inch group (max)

Table 5. Continued

Gill netting

Channel Catfish	Abundance	CPUE– stock	None
	Size structure	PSD, length frequency	None
	Condition	W_r	None)
White Bass	Abundance	CPUE-stock	None
	Size structure	PSD, length frequency	None
	Condition	W_r	None
Hybrid Striped Bass	Abundance	CPUE-stock	None
	Size structure	PSD, length frequency	None
	Condition	W_r	None
	Age and growth	Length at age	None
Low-frequency electrofishing			
Blue Catfish	Abundance	CPUE	None
	Size structure	PSD	None
	Condition	W_r	None

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

Table 6. Percent occurrence with lower and upper 95% confidence limits (CL) of shoreline structural habitat at 351 random sites in Ray Hubbard Reservoir, Texas, August, 2021. Water level was near conservation pool at time of sampling.

Structural habitat type	% Occurrence	Lower CL	Upper CL	Estimate
Bulkhead	25	20.0	30.0	32.0 miles
Natural	57	52.0	62.0	73.0 miles
Rocky	18	14.0	23.0	23.0 miles

Gizzard Shad

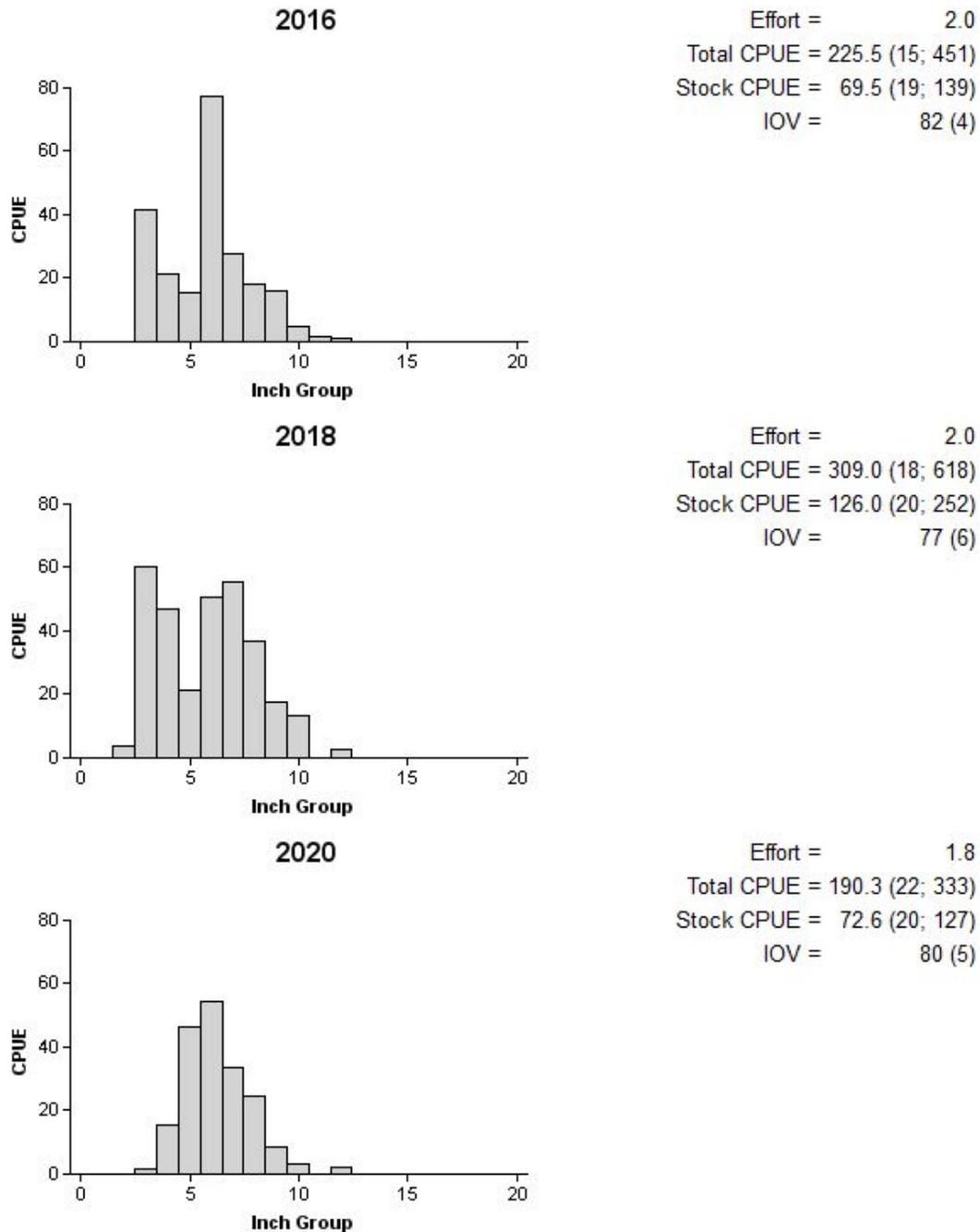


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Ray Hubbard Reservoir, Texas, 2016, 2018, and 2020.

Bluegill

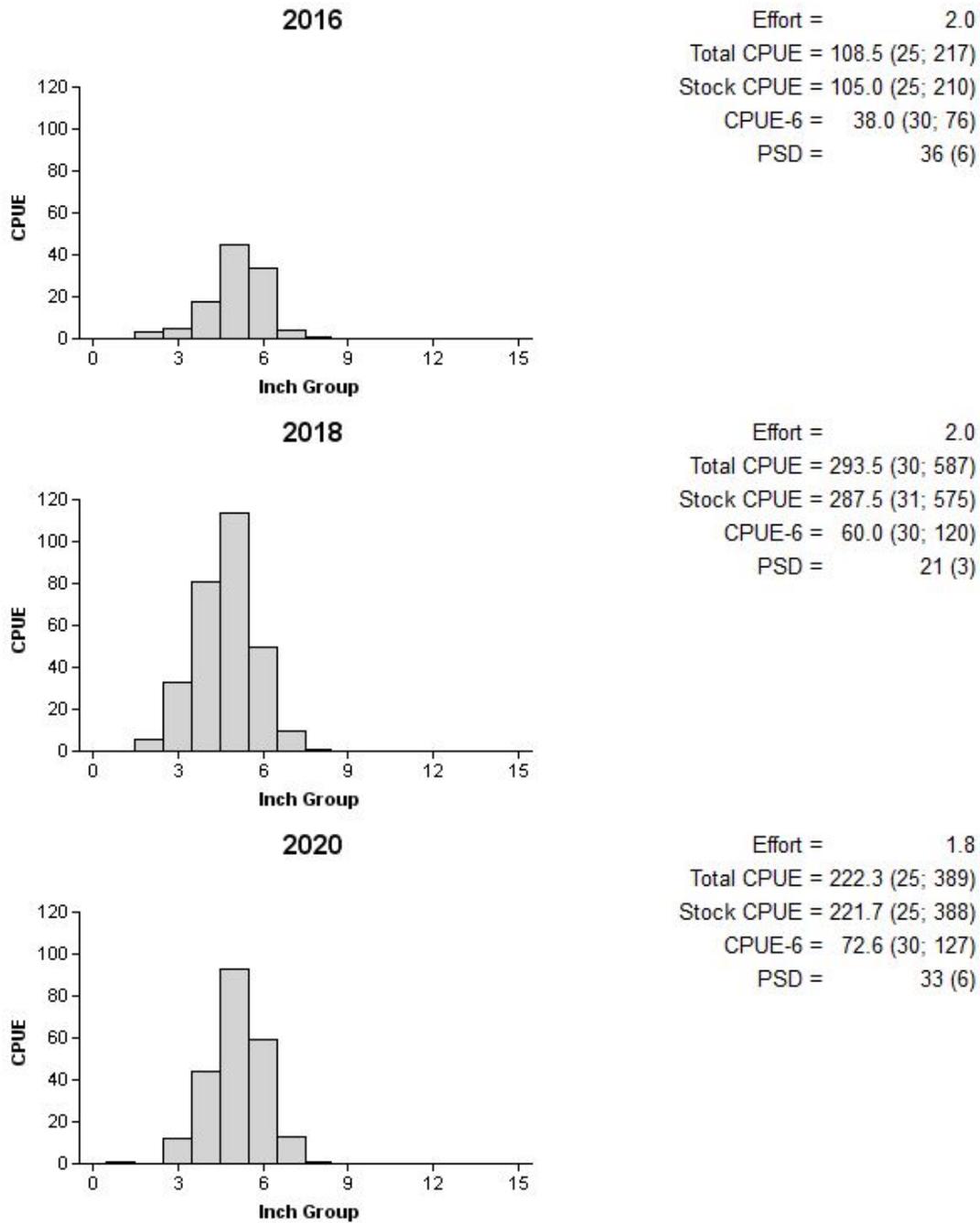


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Ray Hubbard Reservoir, Texas, 2016, 2018, and 2020.

Blue Catfish

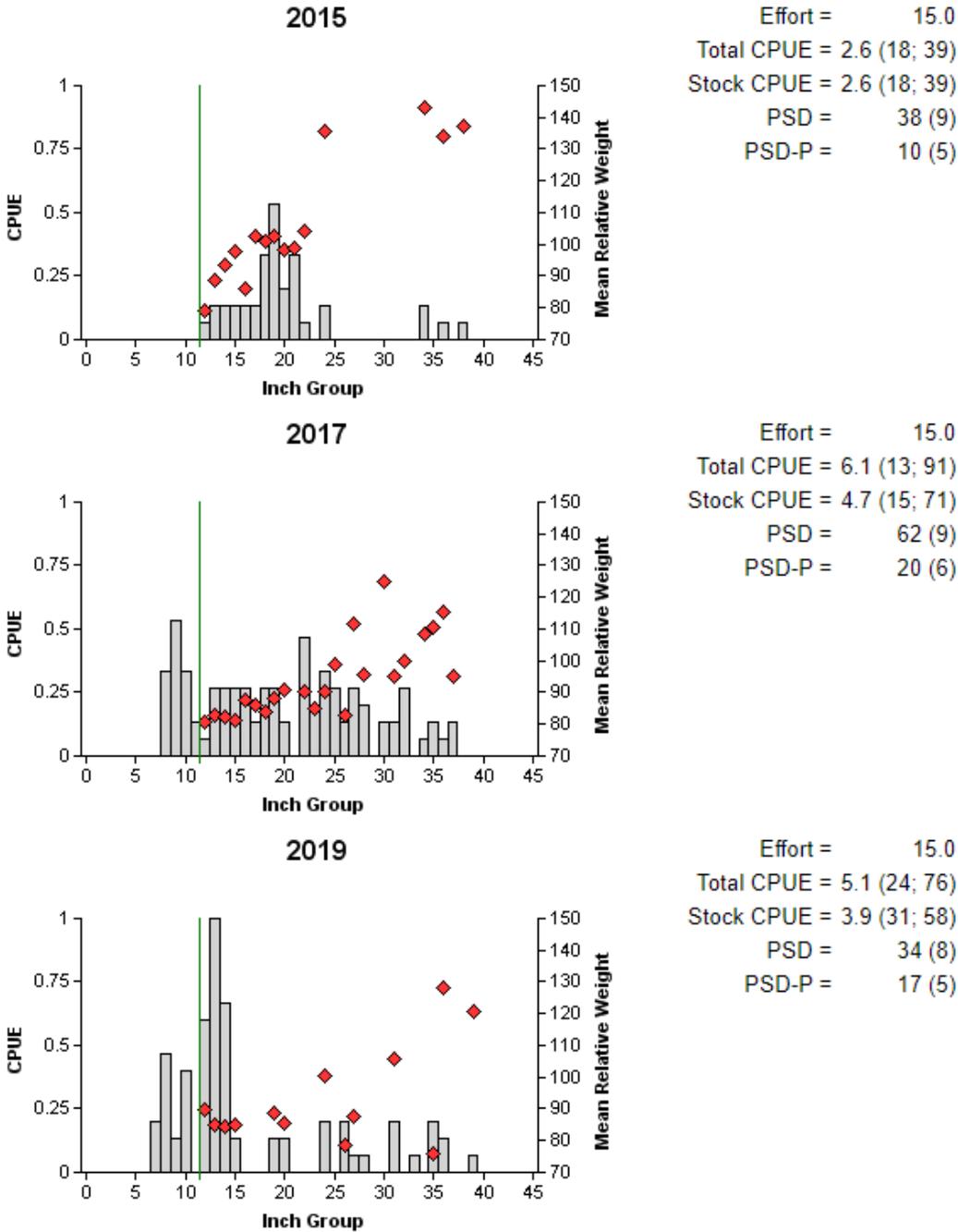


Figure 4. Number of Blue Catfish caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Hubbard Reservoir, Texas, 2015, 2017, and 2019. Vertical line represents length limit at time of sampling.

Blue Catfish

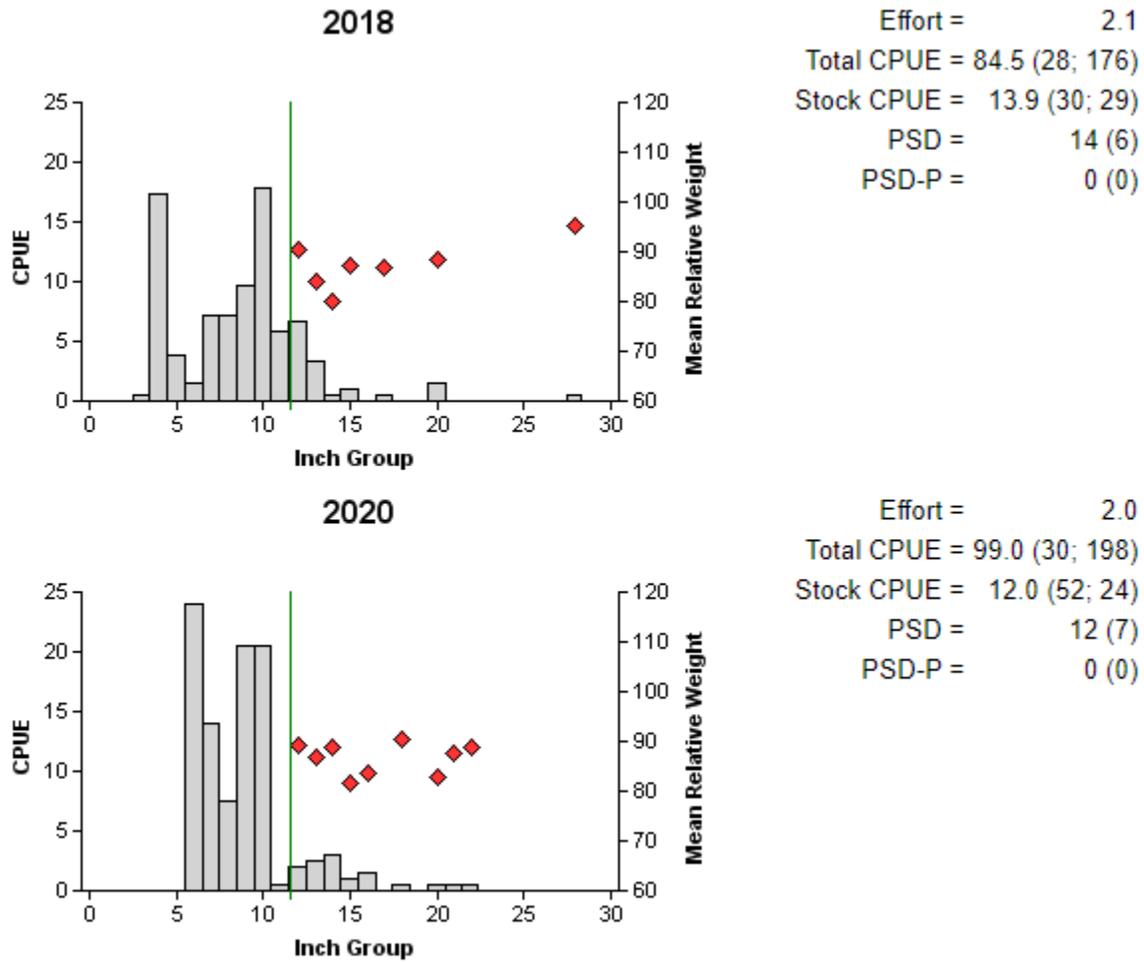


Figure 5. Number of Blue Catfish caught per hour (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for summer low frequency electrofishing surveys, Ray Hubbard Reservoir, Texas, 2018 and 2020. Vertical line represents length limit at time of sampling.

Channel Catfish

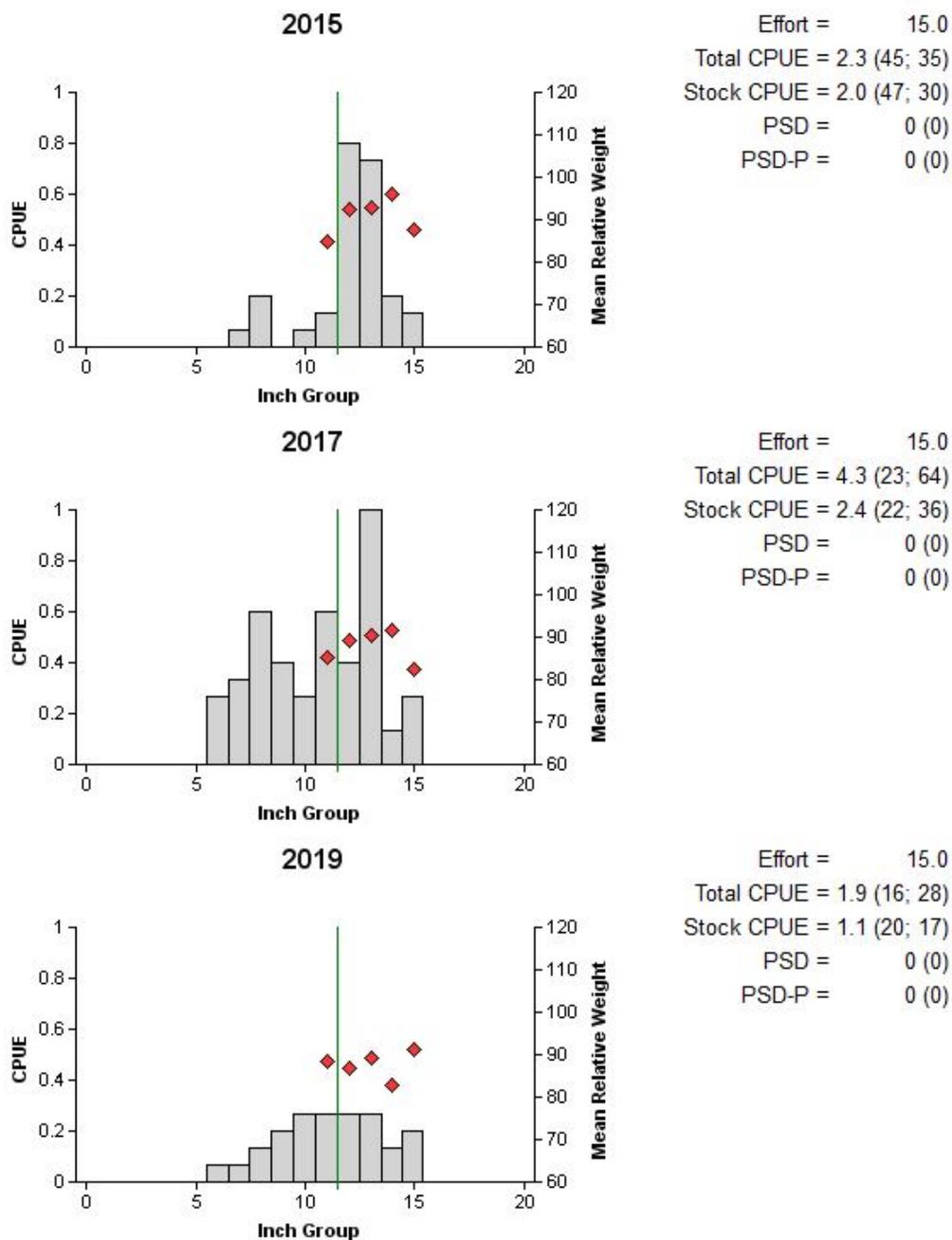


Figure 6. Number of Channel Catfish caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Hubbard Reservoir, Texas, 2015, 2017, and 2019. Vertical line represents length limit at time of sampling.

White Bass

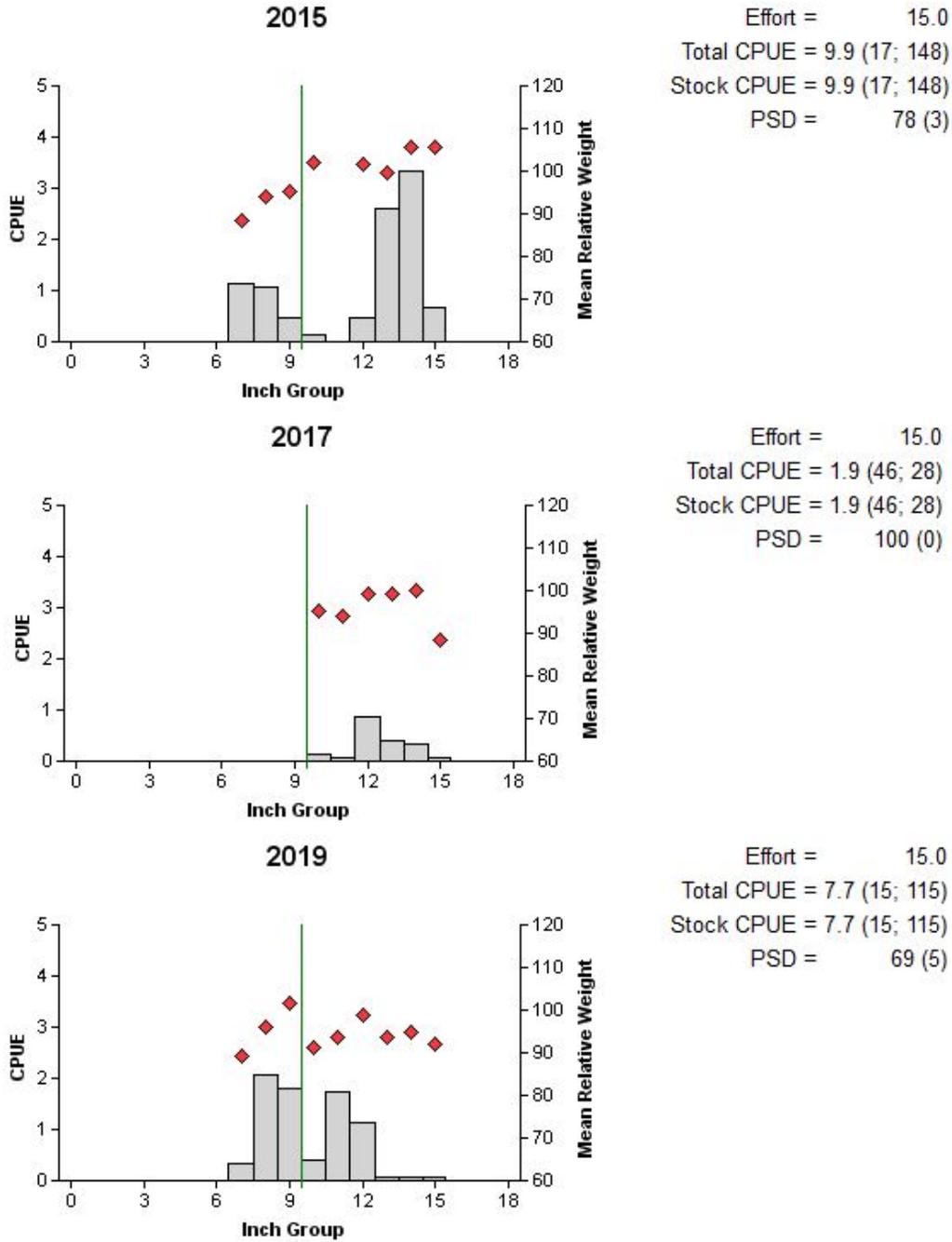


Figure 7. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Hubbard Reservoir, Texas, 2015, 2017, and 2019. Vertical line represents length limit at time of sampling.

Hybrid Striped Bass

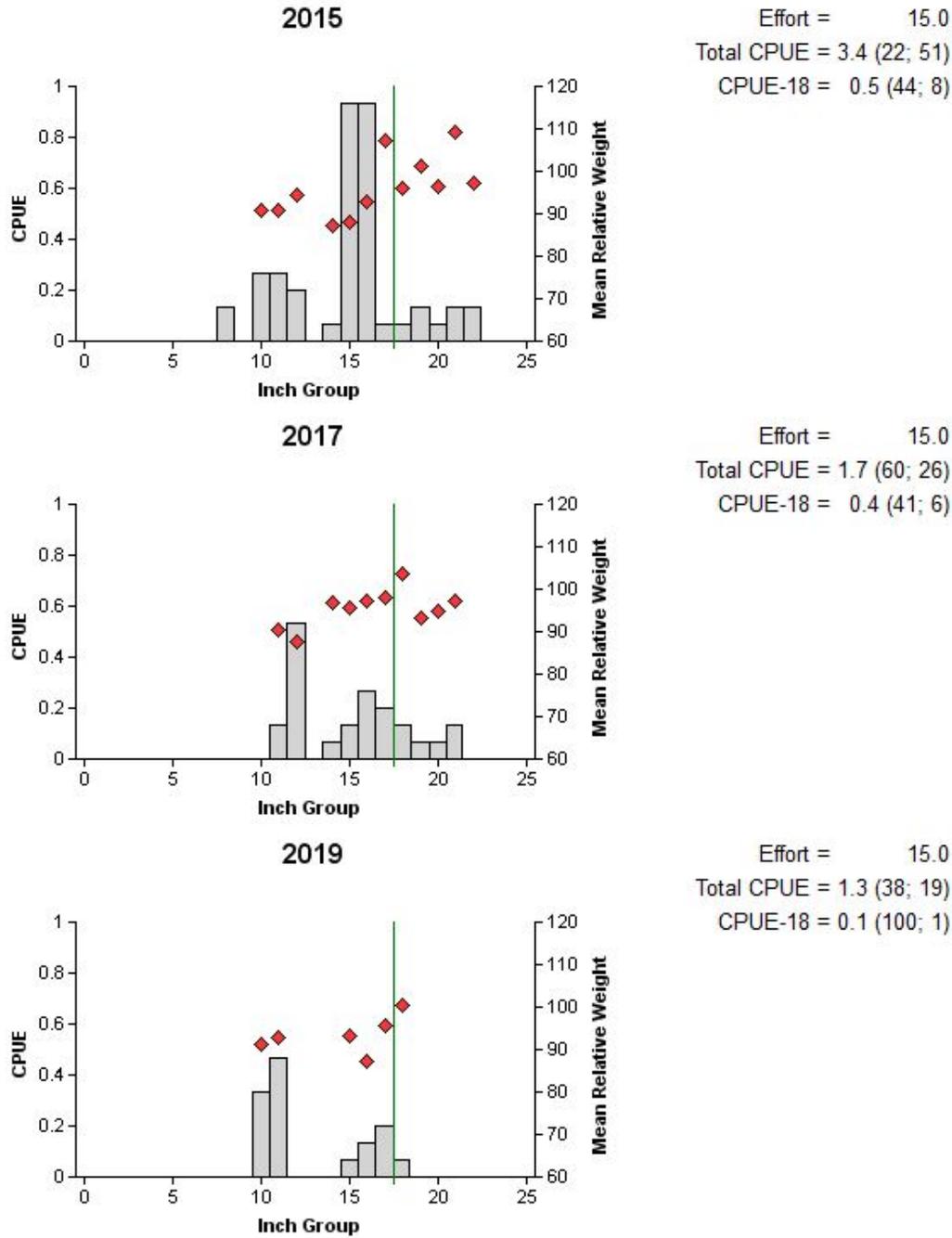


Figure 8. Number of Hybrid Striped Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Ray Hubbard Reservoir, Texas, 2015, 2017, and 2019. Vertical line represents length limit at time of sampling.

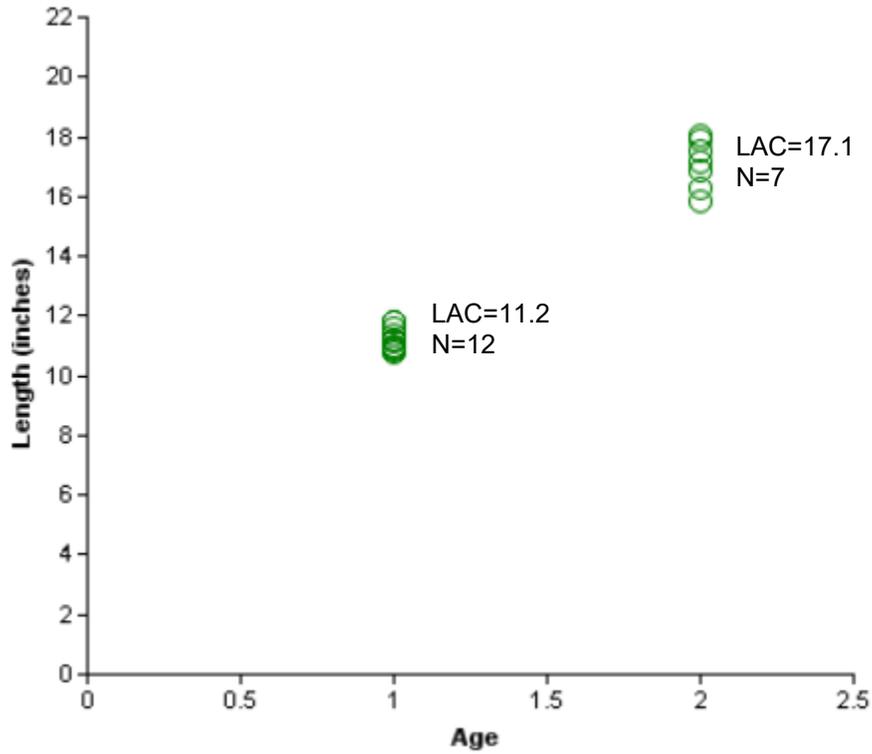


Figure 9. Length at age of capture (LAC) (inches and age sample size) for Hybrid Striped Bass (sexes combined; N=19) collected from gill netting sampling at Ray Hubbard Reservoir, Texas, for spring 2019.

Largemouth Bass

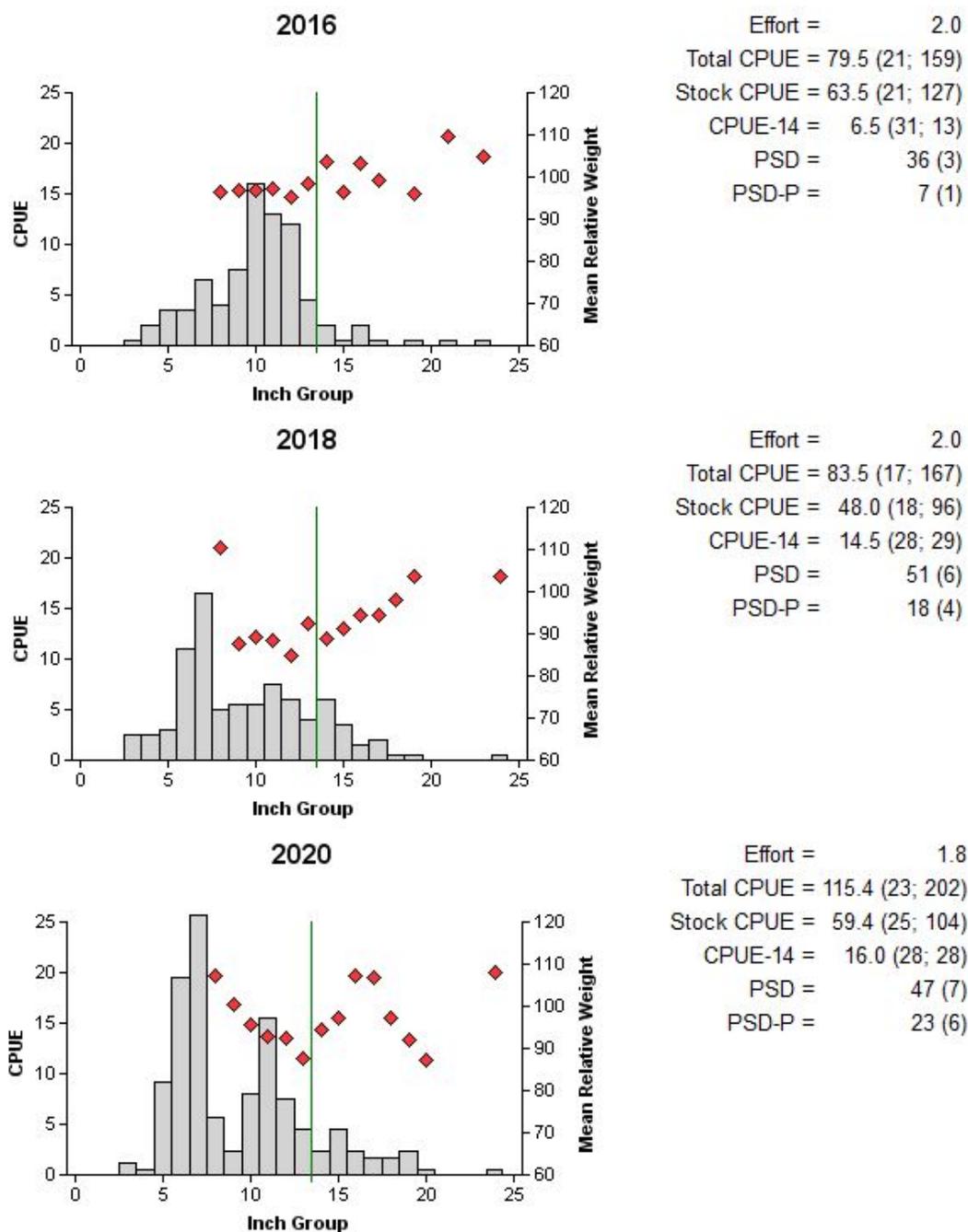


Figure 10. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for Fall electrofishing surveys, Ray Hubbard Reservoir, Texas, 2016, 2018, and 2020. Vertical line represents length limit at time of sampling.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Ray Hubbard Reservoir, Texas, 2004-2016. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2004	29	2	22	5	50	7.1
2008	29	0	NA	0	43	0
2012	30	4	25	1	47	13
2016	30	1	26	3	45	3

White Crappie

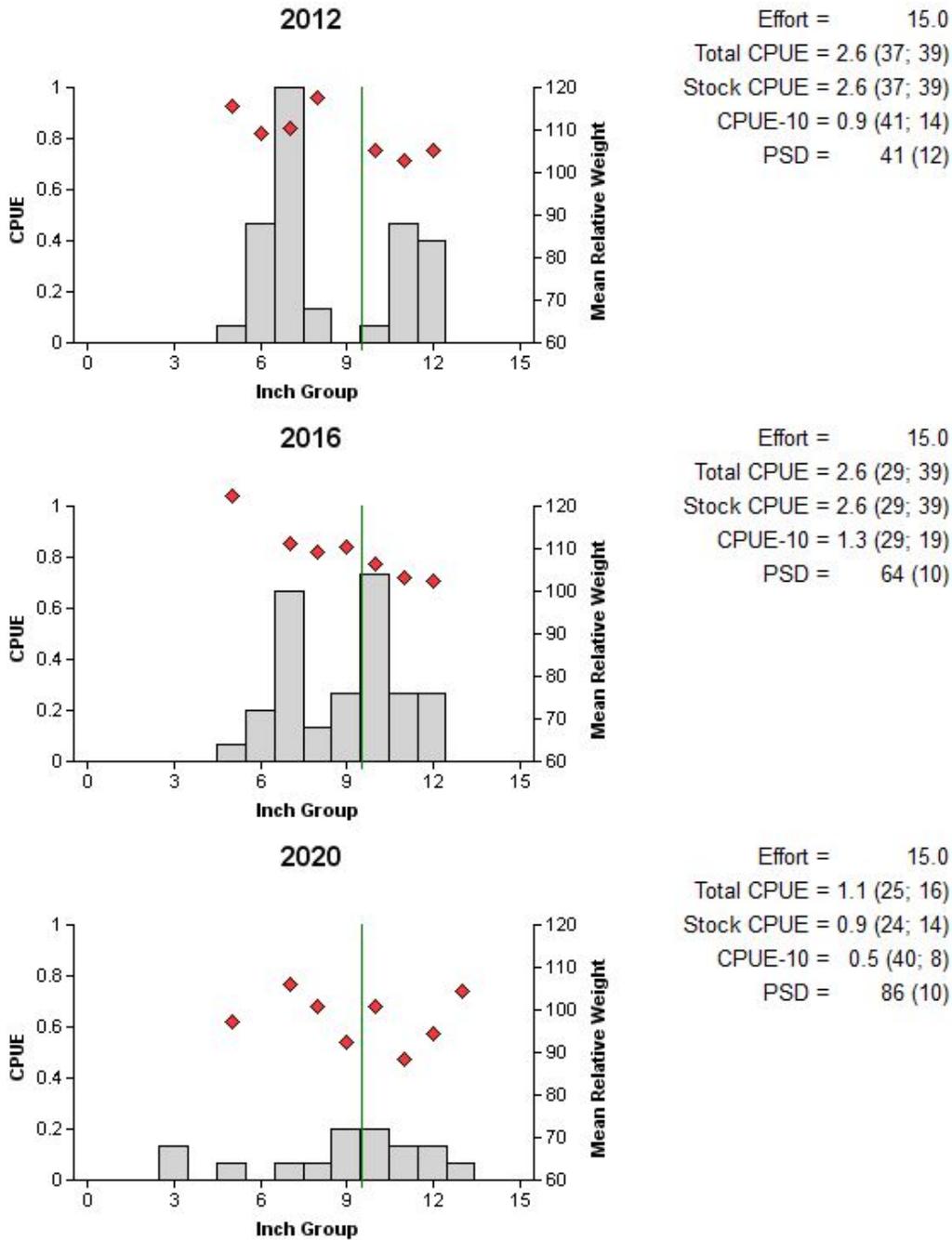


Figure 11. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Ray Hubbard Reservoir, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.

Black Crappie

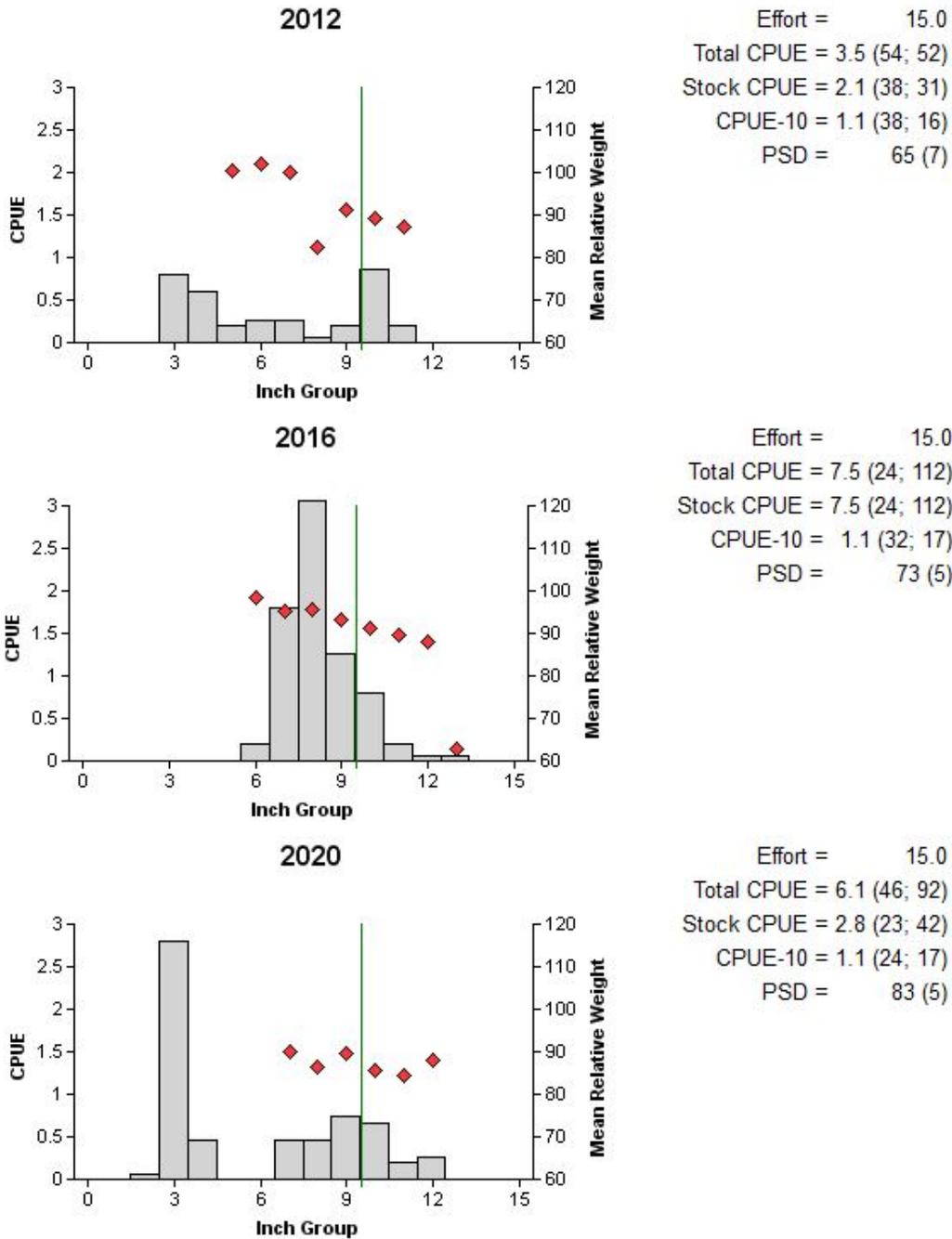


Figure 12. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Ray Hubbard Reservoir, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

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

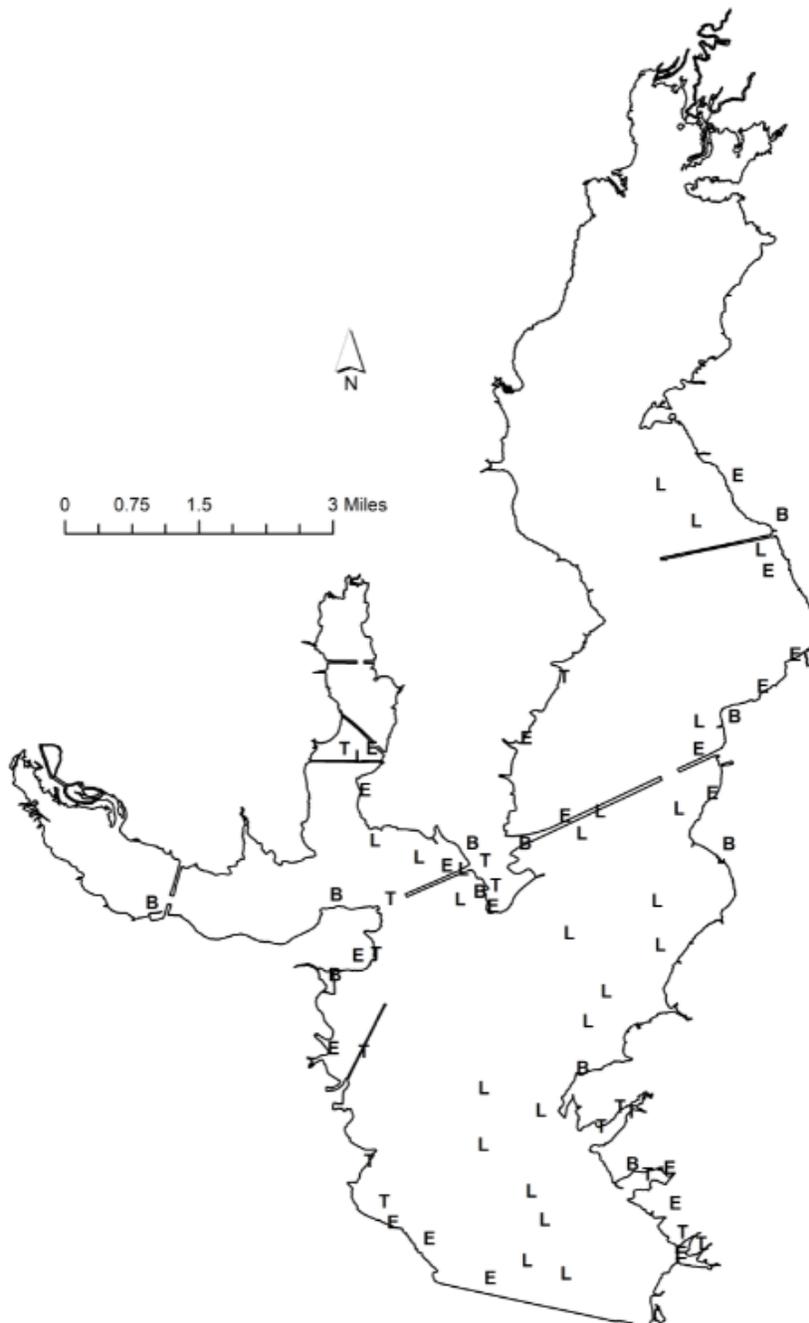
	Survey year			
	2021-2022	2022-2023	2023-2024	2024-2025
Angler Access				X
Creel		X		
Vegetation	X	X	X	X
Electrofishing – Fall		X		X
Electrofishing – Spring				
Trap netting				X
Gill netting		X		X
Report				X

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of most species collected from gill netting in 2019 and trap netting, electrofishing, and low frequency electrofishing in 2020 from Ray Hubbard Reservoir, Texas. Sampling effort was 15 net nights for gill netting, 15 net nights for trap netting, 1.8 hours for electrofishing, and 2.0 hours of low frequency electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing		Low Frequency Electrofishing	
	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Spotted Gar	1	0.1 (100)						
Gizzard Shad	110	7.3 (23)			333.0	190.3 (22)		
Threadfin Shad	5	1 (100)			463	264.6 (24)		
Common Carp	19	1.3 (68)						
Smallmouth Buffalo	22	1.5 (35)						
Blue Catfish	76	5.1 (24)					198	99 (30)
Channel Catfish	28	1.9 (16)						
White Bass	115	7.7 (15)						
Hybrid Striped Bass	19	1.3 (38)						
Bluegill					389	222.3 (25)		
Longear Sunfish					126	72 (41)		
Redear Sunfish					1	0.57 (100)		
Largemouth Bass					202	115.4 (23)		
White Crappie			16	1.1 (25)				
Black Crappie			92	6.1 (46)				
Freshwater Drum	23	1.5 (25)						

APPENDIX B – Map of sampling locations and boat ramps



Location of sampling sites, Ray Hubbard Reservoir, Texas, 2020-2021. Trap net, gill net, low frequency electrofishing, electrofishing stations, and boat ramps are indicated by T, G, L, E, and B respectively. Water level was near or above full pool at time of all surveys.

APPENDIX C – Continued

Appendix C continued.

Gear	Species	Year										Ave
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Gill Netting (fish/net night)	Blue Catfish	2.8		8.3		2.6		6.1		5.1		6.5
	Channel Catfish	4.8		3.6		2.3		4.3		1.9		4.2
	White Bass	4.5		9.1		9.9		1.9		7.7		7.3
	Palmetto Bass	0.1		0.6		3.4		1.7		1.3		2.4
Electrofishing (fish/hour)	Gizzard Shad	676.0	279.0	524.5	554.5	413.5	225.5		309.0		190.3	314.3
	Threadfin Shad	589.0	790.5	1,018.0	312.5	436.5	1,180.0		204.5		264.6	545.6
	Bluegill	168.5	212.0	167.0	76.5	101.0	108.5		293.5		222.3	156.6
	Longear Sunfish	106.0	237.5	95.0	15.0	26.0	44.0		91.0		72.0	105.2
	Redear Sunfish	7.5	26.5	18.0	2.0	4.5	4.5		4.5		0.6	8.4
	Largemouth Bass	97.0	185.5	126.5	76.5	290.5	79.5		83.5		115.4	126
Trap Netting (fish/net night)	White Crappie		2.6					2.6			1.1	7.5
	Black Crappie		3.5					7.5			6.1	3.1
Low Frequency Electrofishing (fish/hour)									84.5		99.0	91.8



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