

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-5

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2014 Fisheries Management Survey Report

**Worth Reservoir**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Worth Reservoir were surveyed in 2014 using electrofishing and trap netting, and in 2015 using gill netting. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Worth Reservoir is a 3,489-acre impoundment, located on the West Fork Trinity River. The reservoir is located entirely in the city limits of Ft. Worth in Tarrant County and was constructed in 1914 by the City as a municipal water supply. Shoreline length is approximately 36 miles. Angler and boat access was adequate. Non-motorized boat access is available in the north end of the reservoir within the Fort Worth Nature Center. There were two handicap-accessible fishing piers on the reservoir. Fishery habitat was primarily shoreline and sporadic stands of native emergent vegetation in the form of water willow, *Justicia americana*, and bulrushes, *Scirpus species*, and also rocky shoreline. Water levels do not fluctuate drastically because of drinking water quality concerns. The City of Fort Worth completed a dredging project in 2014 to increase water storage capacity, improve water quality, and increase water recreation.
- **Fish Consumption Advisory:** The advisory was implemented by the Department of State Health Services (DSHS) in April 2000 because of elevated levels of polychlorinated biphenyls (PCBs) in fish tissues and advised no consumption of any species. The advisory was amended in 2010 to advise no consumption of catfish and Smallmouth Buffalo. More information concerning the advisory can be found at <http://www.dshs.state.tx.us/seafood/>.
- **Management History:** Important sport fishes include Largemouth Bass, White Crappie, White Bass, and Blue and Channel Catfish. All species have been managed with statewide regulations.
- **Fish Community**
  - **Prey species:** Gizzard and Threadfin Shad were sampled in great abundance in the reservoir. Bluegill and Longear Sunfish were also abundant but not many fish over 6 inches were available for anglers.
  - **Catfishes:** The Blue and Channel Catfish catch rates decreased from the previous survey. Flathead catfish were present but none were captured this past survey year.
  - **White Bass:** The White Bass catch rate increased greatly from the previous survey with larger fish available for anglers.
  - **Black basses:** The Spotted Bass catch rate was similar to the previous survey. The Largemouth Bass total catch rate decreased from the previous survey. Recent stockings of Florida Largemouth Bass have appeared to improve genetic composition of the population.
  - **Crappie:** The White Crappie population continues to be high in abundance with quality fish available for anglers. Black Crappie were present but in low abundance.
- **Management Strategies:** Standard monitoring with electrofishing and trap netting will be conducted in 2018 and gill netting surveys in 2019. Low frequency electrofishing will be conducted to target Blue Catfish. Because of the high directed effort for Largemouth Bass, available habitat, and the success of the previous stockings, Florida Largemouth Bass will be stocked in consecutive years and evaluated in 2018.

## INTRODUCTION

This document is a summary of fisheries data collected from Worth Reservoir in 2014-2015. 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 2014-2015 data for comparison.

### *Reservoir Description*

Worth Reservoir is a 3,489-acre impoundment, located on the West Fork Trinity River. The reservoir is located entirely in the city limits of Ft. Worth in Tarrant County and was constructed in 1914 by the City as a municipal water supply. The elongated and serpentine reservoir extends approximately 6 miles upstream from the dam. Shoreline length is approximately 36 miles. Angler and boat access was adequate. However, areas of the reservoir are very shallow and limit boat traffic. There were two handicap-accessible fishing piers on the reservoir. Fishery habitat was primarily shoreline and sporadic stands of native emergent vegetation in the form of water willow, *Justicia americana*, and bulrushes, *Scirpus species*, and also rocky shoreline. Worth Reservoir is currently under a fish-consumption advisory. Worth Reservoir is a eutrophic reservoir (Texas Commission on Environmental Quality 2010). Other descriptive characteristics for Worth Reservoir are in Table 1.

### *Angler Access*

Worth Reservoir has two public boat ramps located at Arrow S Park and Casino Beach Park. Each ramp has adequate parking and a courtesy dock. There is also a small vessel access area along with a courtesy dock on the north end of the reservoir within the Fort Worth Nature Center. Additional boat ramp characteristics are in Table 2.

Shoreline access is adjacent to the public boat ramp areas and several public parks around the reservoir. Fishing docks are needed at the public boat ramp and park areas.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Brock and Hungerford 2011) included:

1. Continue communication with Department of State Health Services (DSHS), United States Geological Survey (USGS), and the City of Fort Worth's Environmental Service Division regarding future testing of fish tissue and possible removal of contaminated sediments. Continue informing and educating the public regarding the fish consumption advisory and catch and release opportunities.  
**Action:** The DSHS has no immediate plans to conduct additional testing of fish tissues. Dredging operations were completed but areas of contamination were not dredged. No other information has been received regarding possible removal of the contaminated sediments. Numerous correspondences via social media, phone calls and emails have been issued to inquiring anglers.
2. Request Florida Largemouth Bass (FLMB) stockings in 2012 and 2013 and conduct genetic analysis in 2014-2015.  
**Action:** Stockings were conducted in 2011, 2012, and 2013. Genetic analysis was conducted in 2014 and results are presented in this report.

3. Work with the City of Fort Worth to get an estimate of the number of non-motorized boaters that use the Fort Worth Nature (FWNC) access. These data could be used to support efforts to promote fishing in the upper end of the reservoir and make improvements to access area.  
**Action:** After discussing the possibility of conducting a survey at the FWNC, we were informed that plans were already being made to improve the non-motorized boating access area. A courtesy dock was installed in 2013 with money donated by the Friends of the Nature Center, material donated by the Tarrant Regional Water District, and labor by the City of Fort Worth. No bank fishing continues to be the rule in the Fort Worth Nature Center.
4. Invasive nuisance organisms such as Giant Salvinia (*Salvinia molesta*) and zebra mussels (*Dreissena polymorpha*) have been spreading around aquatic environments in Texas.  
**Action:** The controlling authority, City of Fort Worth, was contacted regarding the zebra mussel issue. Signs were erected at public ramps.
5. Work with the City of Fort Worth and TPWD watershed management personnel to assist with development of dredging plan.  
**Action:** IF staff attended several presentations by the City of Fort Worth Water Department regarding the dredging project. Information regarding grants for future boat ramp improvements and angler access improvements were communicated to City of Fort Worth staff. Dredging operations began in August 2012 and were completed in early 2014.

**Harvest regulation history:** Sport fish populations in Worth Reservoir have been managed with statewide regulations (Table 3).

**Stocking history:** Worth Reservoir was last stocked in 2013 with 179,209 Florida Largemouth Bass. The complete stocking history is in Table 4.

**Water transfer:** Worth Reservoir is a main drinking water supply for the City of Fort Worth. Although no transfer water is pumped directly into the reservoir, water is pumped from Richland Chambers and Cedar Creek Reservoirs into Eagle Mountain Reservoir which releases water into Worth Reservoir.

**Zebra mussels:** The exotic species zebra mussel has been found in several DFW area reservoirs. Zebra mussel DNA has been found in Worth Reservoir. However no adults or larva have been found. Bridgeport Reservoir, an infested reservoir, releases water into Eagle Mountain Reservoir which releases water into Worth Reservoir.

**Fish consumption advisory history:** Worth Reservoir is currently under a fish-consumption advisory because of elevated levels of polychlorinated biphenyls (PCBs) in fish tissues. The advisory was first implemented by the Department of State Health Services (DSHS) in April 2000 and advised no consumption of any species. The advisory was amended in 2010 to advise no consumption of Blue and Channel Catfish and Smallmouth Buffalo. In 2011, 82% of anglers surveyed indicated they were aware of the fish consumption advisory (Brock and Hungerford 2011). More information concerning the advisory can be found at <http://www.dshs.state.tx.us/seafood/>.

## METHODS

Fishes were collected by electrofishing (1.0 hour at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (5 net nights at 5 stations). Catch per unit effort (CPUE) for electrofishing was

recorded as the number of fish caught per hour (fish/hr) of actual electrofishing and, for gill and trap nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distributions (PSD) as defined by Guy et al. (2007)], and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. A category 2 age and growth analysis was conducted on Largemouth Bass (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Ages were determined using otoliths.

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2005 through 2012 and by electrophoresis for previous years.

Source for water level data was the United States Geological Survey (USGS 2015) and from the Tarrant Regional Water District.

## RESULTS AND DISCUSSION

**Habitat:** The last habitat survey was conducted in 2010 (Brock and Hungerford 2011). The habitat has remained consistent. The littoral zone habitat consisted mainly of shoreline and sporadic stands of emergent aquatic vegetation in the form of water willow and bulrushes and rocky shoreline. In addition to the shoreline stands of emergent aquatic vegetation, flooded timber is also present in the northern end of the reservoir.

**Creel:** The last creel was conducted in 2010 (Brock and Hungerford 2011).

**Prey species:** The 2014 fall electrofishing catch rate of Threadfin Shad was 260.0/hr which was higher than the previous survey and the reservoir average of 160.0/hr (Appendix A and C). The Gizzard Shad catch rate of 640.0/hr was also well above the previous survey and above the reservoir average of 392.3/hr. (Figure 2; Appendix A and C). Index of vulnerability for Gizzard Shad was high, indicating that 92% of Gizzard Shad captured in 2014 were available as forage. This was similar to the IOV estimate in the previous survey. The electrofishing catch rate of Bluegill in 2014 (147.0/hr) was lower than the rate observed in the previous survey and lower than the reservoir average (Figure 3; Appendix C). The catch rate of Bluegill  $\geq$  6 inches also decreased greatly in 2014 (9.0/hr) as compared to the rate observed in the previous survey (100.0/hr) (Figure 2). The Longear Sunfish catch rate observed in 2014 (213.0/hr) was also much lower than rate in the previous survey but similar to reservoir average of 220.0/hr (Appendix C).

**Catfishes:** The gill netting catch rate of Blue Catfish in 2015 of 3.0/nn was much lower than previously observed catch rates but still near the reservoir average of 3.6/nn (Figure 4). Size structure was adequate as indicated by a PSD value of 53. Body conditions of the Blue Catfish were average with relative weight values near 90 for most size classes. Several large Blue Catfish were caught by anglers and a new lake record of 75.75 lbs. was established in 2012. The gill net catch rate of Channel Catfish was 3.2 /nn in 2015 and was much lower than the previous two samples (Figure 5). Size structure indices were lower than the previous survey.

**White Bass:** The 2015 gill netting catch rate of White Bass of 20.6/nn was much higher than the previous sample and the reservoir average of 6.6/nn (Figure 6). Size structure was good as indicated by a PSD value of 79.

**Black Basses:** The total electrofishing catch rate of Spotted Bass in 2014 was 42.0/hr which was similar to past surveys and slightly lower than the reservoir average of 50.3/hr (Figure 7). PSD value decreased from the previous survey. The total electrofishing catch rate of Largemouth Bass was 60.0/hr which was much lower than the previous survey and the reservoir average of 121.8/hr (Figure 8). The size structure of the population improved from previous surveys as indicated by a PSD value of 57. Body condition in 2014 was at or near optimal for most size classes of fish. Growth of Largemouth Bass in Worth Reservoir was good with fish reaching 14 inches after 2 years (Figure 9). Florida Largemouth Bass stockings have had a positive influence on largemouth genetics. Genetic analysis showed an increase in Florida alleles (57%) from the previous sample in 2010 (Table 6).

**Crappie:** The trap netting catch rate of White Crappie was 24.0/nn in 2014, which was higher than the previous survey and reservoir average of 19.9/nn and (Figure 10). The size structure was very good as indicated by a PSD value of 63. Black Crappie are present in the reservoir but historical catch rates have been low (Appendix A and C). The 2014 trap netting catch rate was 1.6/nn.

## Fisheries management plan for Worth Reservoir, Texas

Prepared – July 2015.

**ISSUE 1:** A fish consumption advisory is currently in place which advises non consumption of Smallmouth Buffalo and all Catfish species. All other species are deemed safe to eat.

### MANAGEMENT STRATEGY

1. Continue informing and educating the public regarding the fish consumption advisory through news releases and signage maintenance. Emphasize the different species that are safe and unsafe to eat.

**ISSUE 2:** Worth Reservoir has better habitat than most district reservoirs because of minimal water level fluctuations. However most of this habitat is in the form of shoreline emergent vegetation. Floating and submersed aquatic vegetation may provide better fish habitat.

### MANAGEMENT STRATEGY

1. Conduct test plantings of floating and submersed aquatic vegetation. Plants will be obtained from the Texas Fresh Water Fisheries Center nursery and other local sources.

**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 (*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 City of Fort Worth authority to post appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

**ISSUE 4:** Worth reservoir has trophy Blue Catfish potential. Catch statistics have been inconsistent with gillnet survey samples.

### MANAGEMENT STRATEGIES

1. Conduct low frequency electrofishing surveys to estimate relative abundance and population indices of Blue Catfish in late summer of 2016 and 2018. Determine if low frequency electrofishing is a viable method to collect Blue Catfish estimates.



**ISSUE 5:** The Largemouth Bass population should have the potential to grow to quality size. Worth Reservoir has better habitat than most district reservoirs because of minimal water level fluctuations. The current water-body record for Largemouth Bass is 12.0 lbs. The last FLMB stocking appeared to be successful at improving population genetics. The Largemouth Bass population receives 58% of the total angling effort on Worth Reservoir (Brock and Hungerford 2011).

#### MANAGEMENT STRATEGY

1. Request FLMB stockings in 2016 and 2017 and conduct genetic analysis in 2018-2019.

#### SAMPLING SCHEDULE JUSTIFICATION

Standard monitoring of sport fish species with electrofishing, trap netting, and gill netting will be conducted every 4 years with the next sampling and report scheduled for 2018-2019. Low frequency electrofishing will be conducted in 2016 and 2018 to monitor the Blue Catfish population.

## LITERATURE CITED

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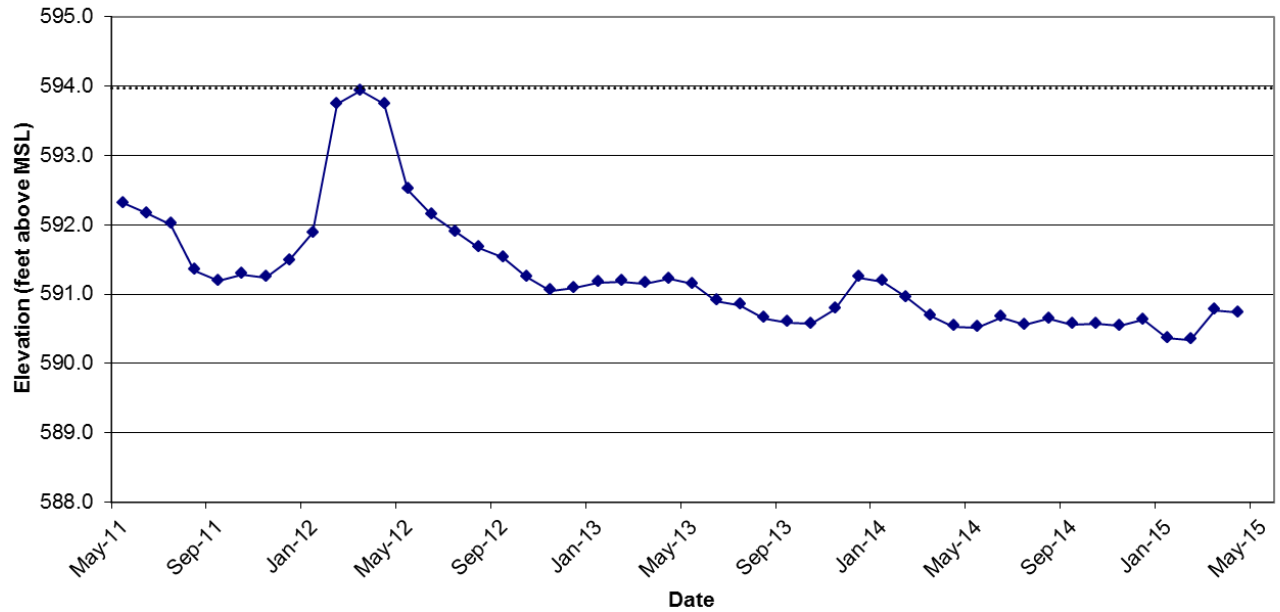


Figure 1. Mean monthly water level elevations in feet above mean sea level (MSL) recorded for Worth Reservoir, Texas from May 2011 – April 2015. Conservation pool is 594 feet above MSL and is represented by the dotted line.

Table 1. Characteristics of Worth Reservoir, Texas.

Characteristic	Description
Year Constructed	1914
Controlling authority	City of Fort Worth
Counties	Tarrant
Reservoir type	Mainstream Trinity River
Conductivity	375 umhos/cm

Table 2. Boat ramp characteristics for Worth Reservoir, Texas, September, 2014. Reservoir elevation at time of survey was 590.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Casino Beach	32.8188 -97.4524	Y	100	589.0	Good
Arrow S Park	32.7942 -97.4536	Y	50	589.0	Good
Fort Worth Nature Center (Small Vessel Only)	32.8483 -97.4743	Y	20	NA	Good

Table 3. Harvest regulations for Worth Reservoir Texas.

Species	Bag limit	Length limit (inches)
Catfish: Channel, Blue, their hybrids and subspecies	25	12 minimum
Catfish: Flathead	5	18 minimum
Bass, White	25	10 minimum
Bass: Spotted	5	none
Bass: Largemouth	In any combination	14 minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25	10 minimum

Table 4. Stocking history of Worth, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) 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.

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Life Stage</b>	<b>Mean TL (in)</b>
Blue Catfish	1990	36,465	FGL	2.0
	Total	36,465		
Channel Catfish	1972	35,000	AFGL	7.9
	Total	35,000		
Florida Largemouth Bass	1975	150,012	FRY	1.0
	1991	178,173	FGL	1.2
	1994	178,606	FGL	1.3
	1999	179,209	FGL	1.3
	2011	173,982	FGL	1.5
	2012	189,000	FGL	1.6
	2013	173,200	FGL	1.5
Total	1,222,182			
Green Sunfish x Redear Sunfish	1972	15,000		UNK
	Total	15,000		
Largemouth Bass	1967	200,000	UNK	UNK
	1969	200,000	UNK	UNK
	1971	50,000	UNK	UNK
	1980	85	UNK	UNK
	Total	450,085		
Palmetto Bass (Striped X White Bass Hybrid)	1978	12,666	UNK	UNK
	1979	1,093,000	FRY	0.4
	1981	948,550	FRY	0.4
	Total	2,054,216		
Threadfin Shad	1984	1,000	AFGL	3.0
	Total	1,000		

## Gizzard Shad

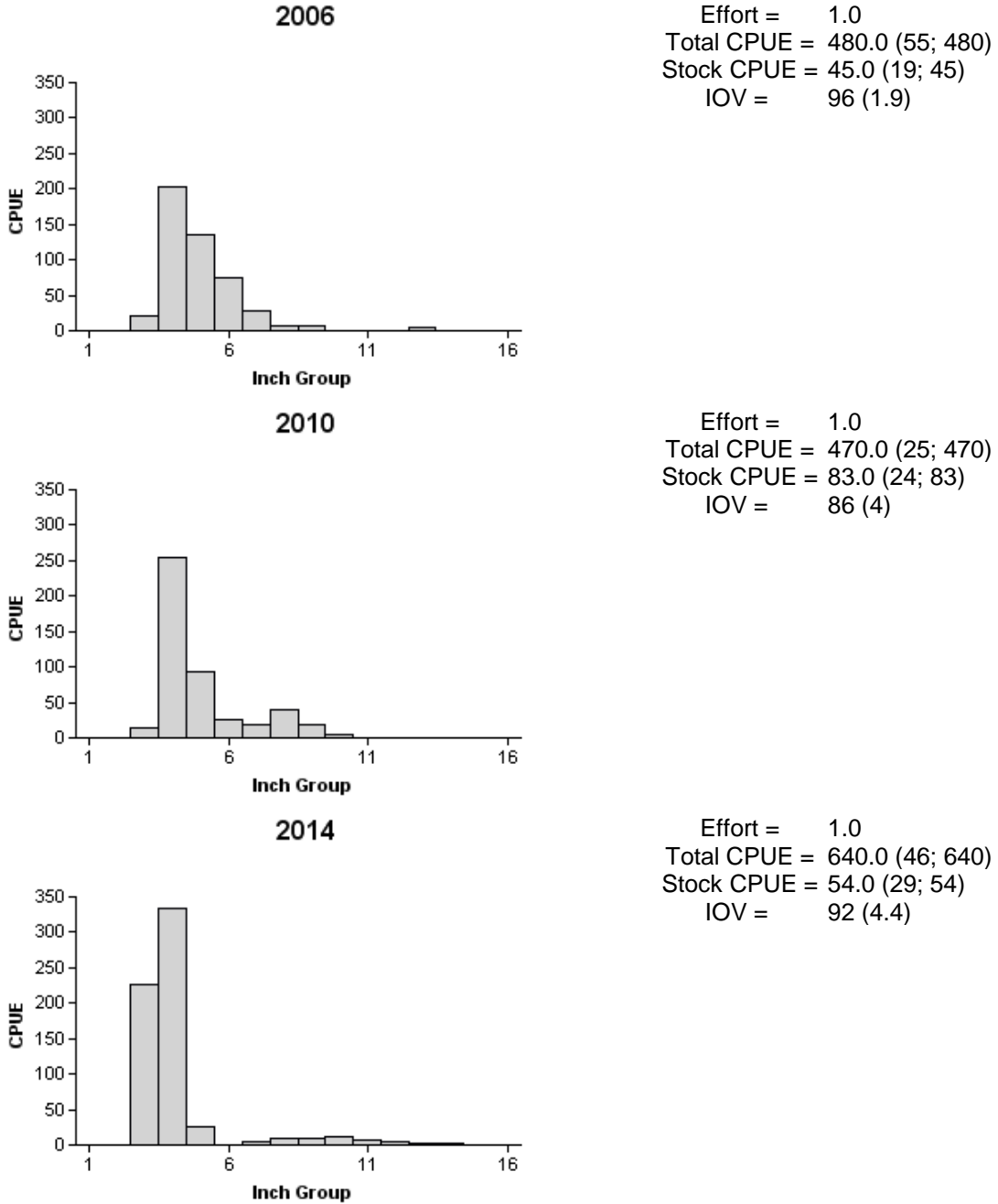
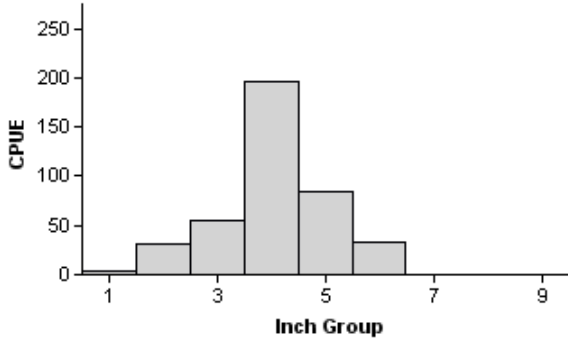


Figure 2. Number of Gizzard Shad caught per hour (CPUE; bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Worth Reservoir, Texas, 2006, 2010, and 2014.

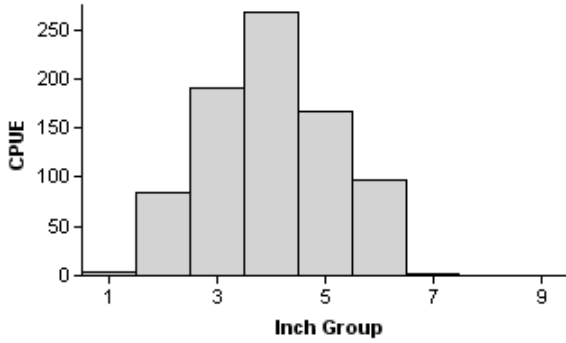
# Bluegill

2006



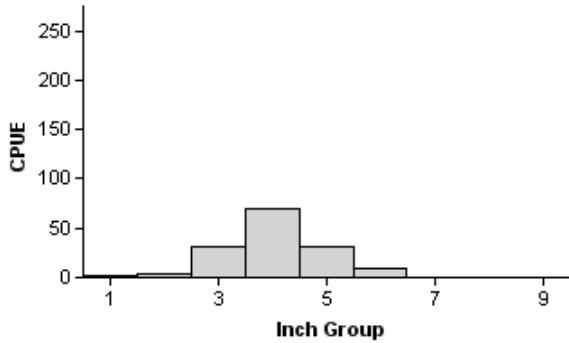
Effort = 1.0  
 Total CPUE = 404.0 (18; 404)  
 Stock CPUE = 369.0 (18; 369)  
 CPUE-6 = 33.0 (19; 33)  
 PSD = 9 (1.4)

2010



Effort = 1.0  
 Total CPUE = 813.0 (16; 813)  
 Stock CPUE = 725.0 (16; 725)  
 CPUE-6 = 100.0 (23; 100)  
 PSD = 14 (2)

2014



Effort = 1.0  
 Total CPUE = 147.0 (26; 147)  
 Stock CPUE = 142.0 (25; 142)  
 CPUE-6 = 9.0 (72; 9)  
 PSD = 6 (4.1)

Figure 3. Number of Bluegill caught per hour (CPUE; bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Worth Reservoir, Texas, 2006, 2010, and 2014.

## Blue Catfish

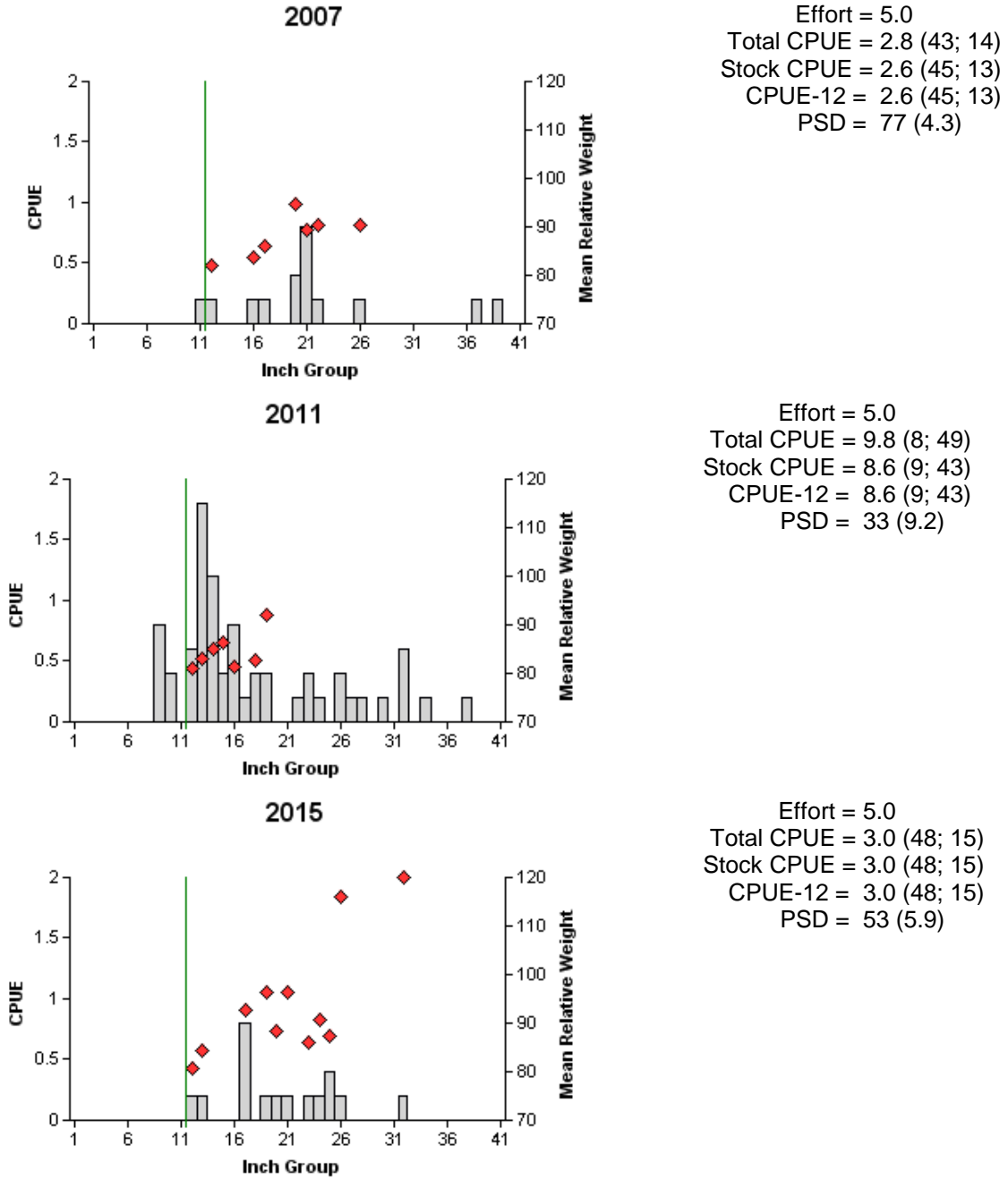


Figure 4. Number of Blue Catfish caught per net night (CPUE; bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Worth Reservoir, Texas, 2007, 2011, and 2015. Vertical line represents length limit at time of sampling.



## Channel Catfish

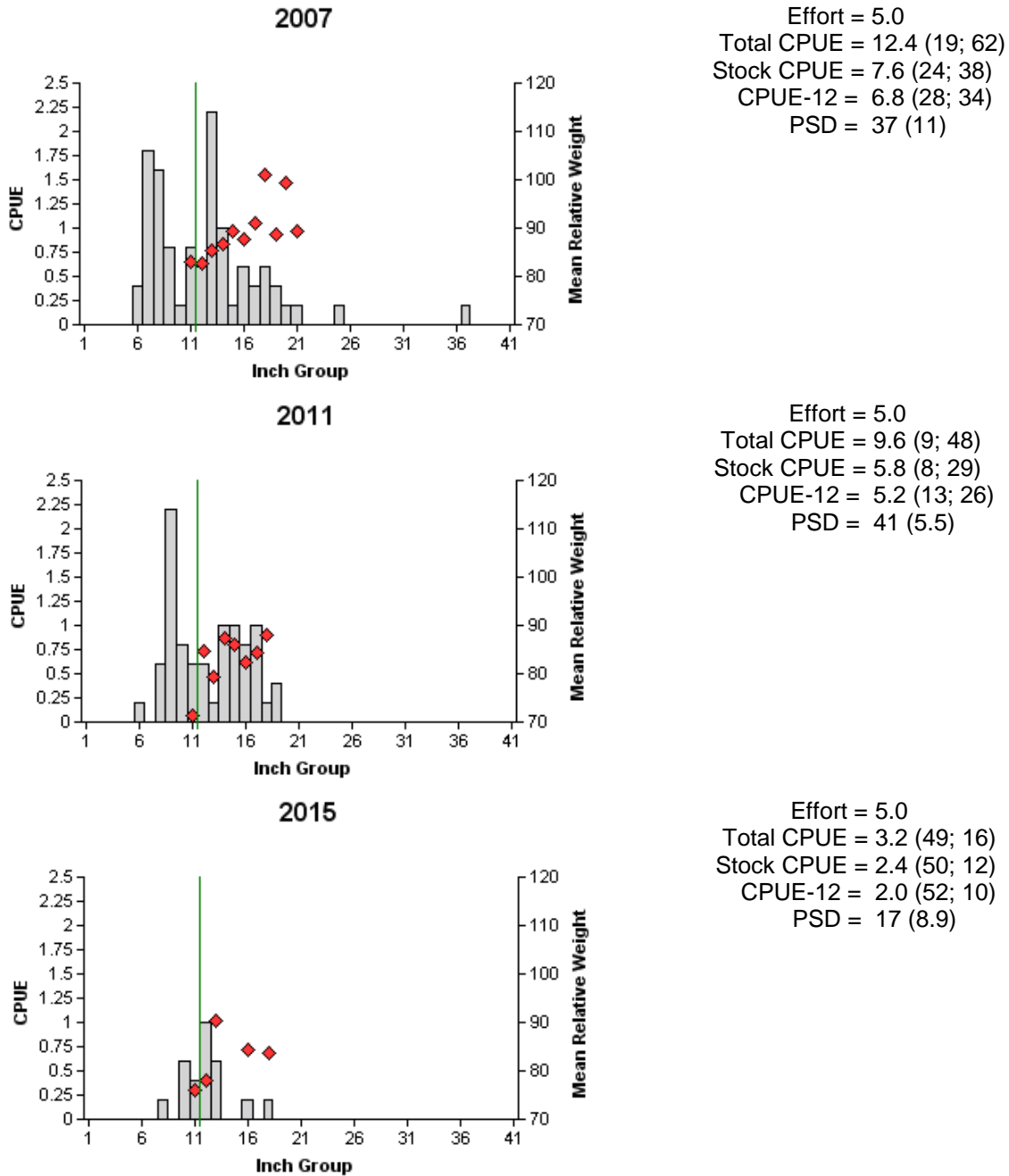
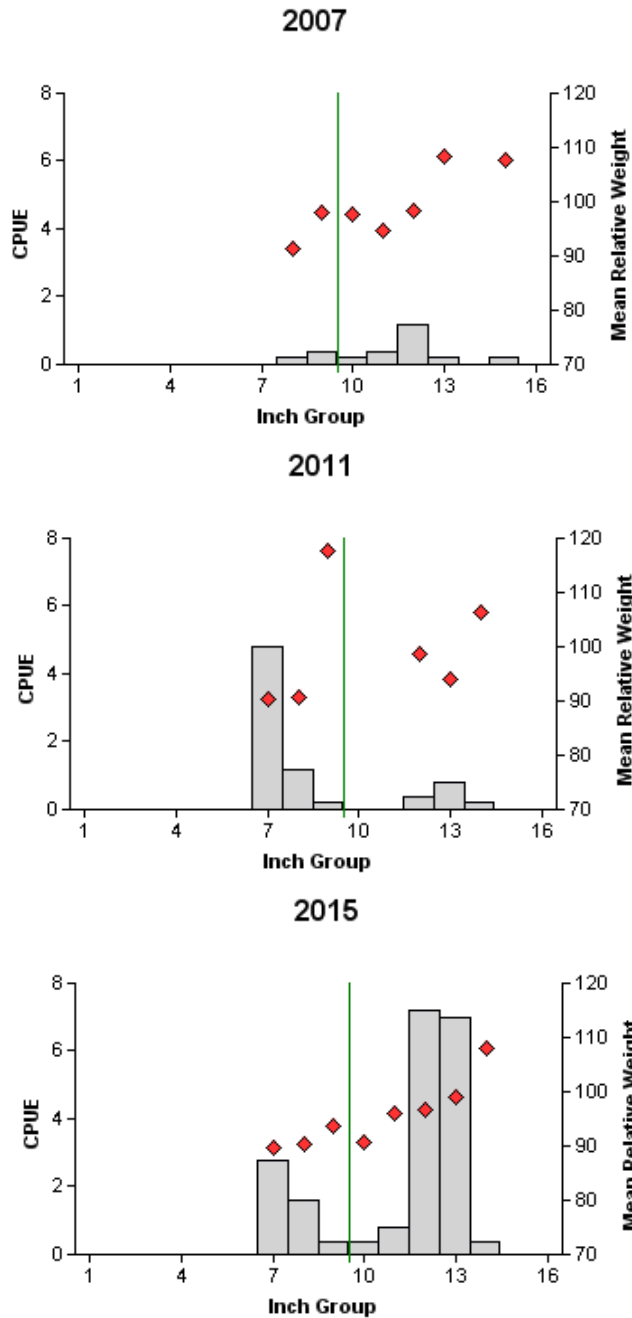


Figure 5. Number of Channel Catfish caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Worth Reservoir, Texas, 2007, 2011, and 2015. Vertical line represents length limit at time of sampling.

## White Bass



Effort = 5.0  
 Total CPUE = 2.8 (41; 14)  
 Stock CPUE = 2.8 (41; 14)  
 CPUE-10 = 2.2 (36; 11)  
 PSD = 93 (6.3)

Effort = 5.0  
 Total CPUE = 7.6 (16; 38)  
 Stock CPUE = 7.6 (16; 38)  
 CPUE-10 = 1.4 (53; 7)  
 PSD = 21 (6.8)

Effort = 5.0  
 Total CPUE = 20.6 (20; 103)  
 Stock CPUE = 20.6 (20; 103)  
 CPUE-10 = 15.8 (18; 79)  
 PSD = 79 (5)

Figure 6. Number of White Bass caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Worth Reservoir, Texas, 2007, 2011, and 2015. Vertical line represents length limit at time of sampling.

## Spotted Bass

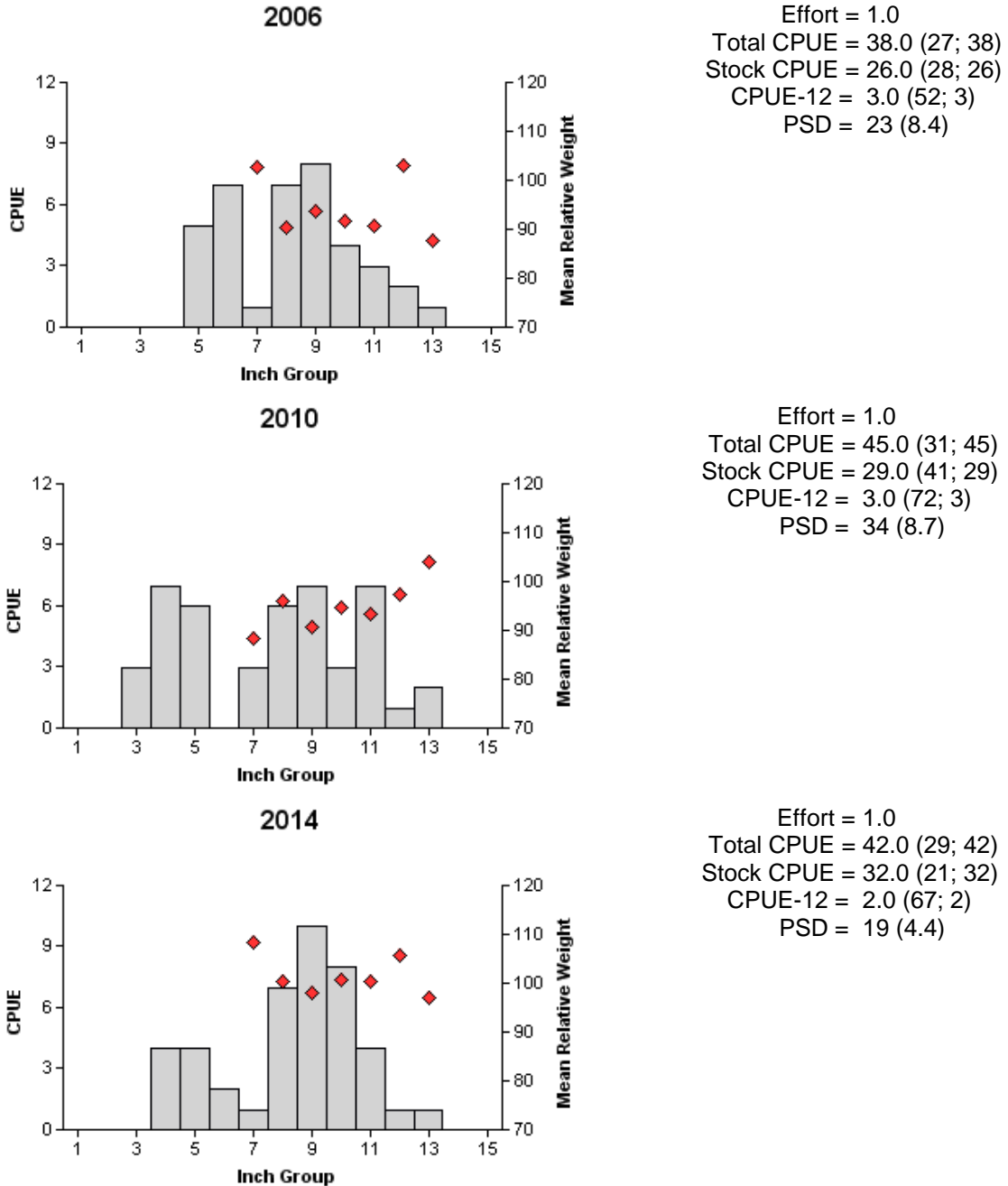


Figure 7. Number of Spotted Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Worth Reservoir, Texas, 2006, 2010, and 2014.

## Largemouth Bass

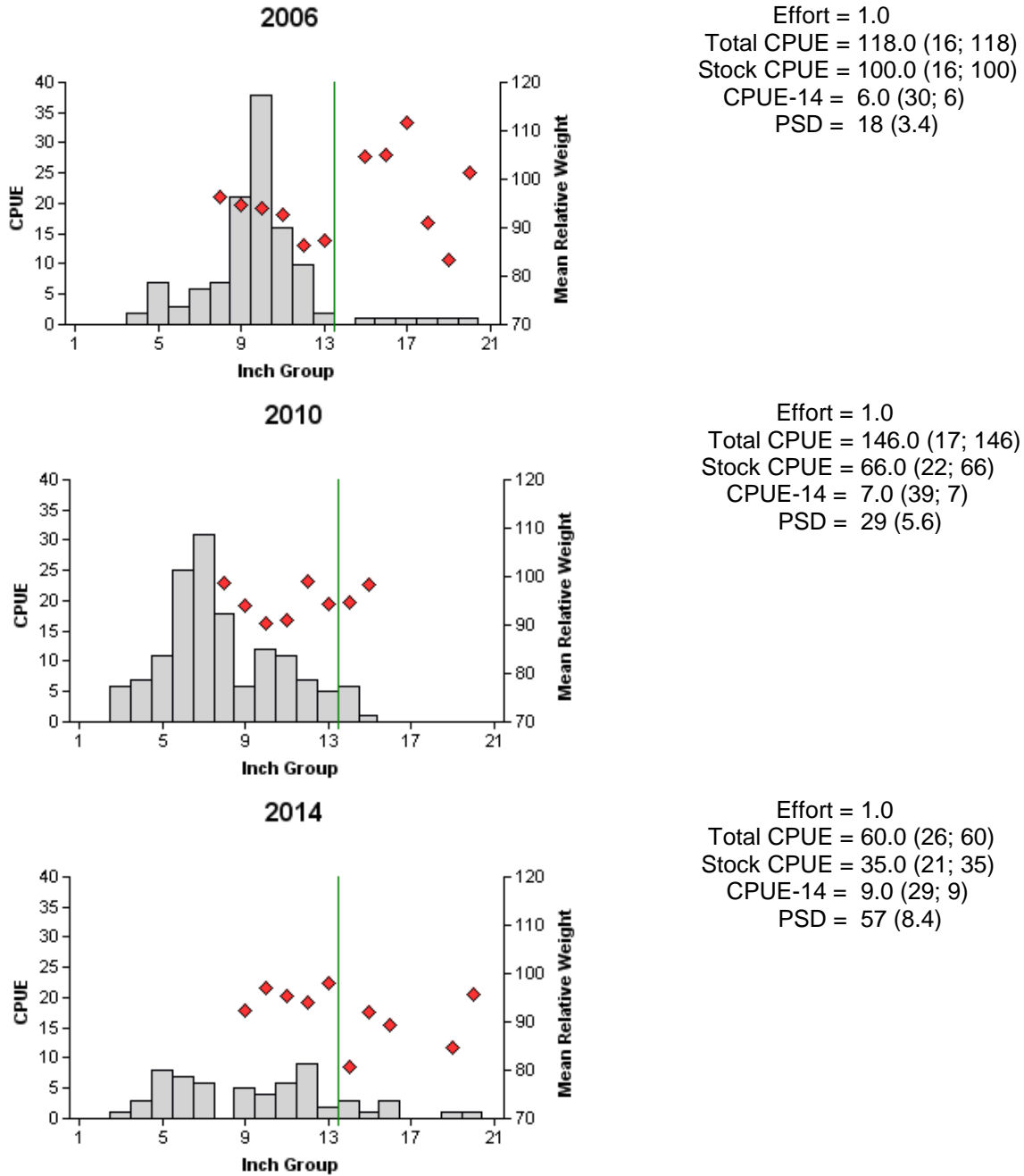


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Worth Reservoir, Texas, 2006, 2010, and 2014. Vertical lines represent length limit at time of sampling.

Table 5. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Worth Reservoir, Texas, 2010 and 2014. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2010	30	0	26	4	24	0
2014	29	0	29	0	43	0

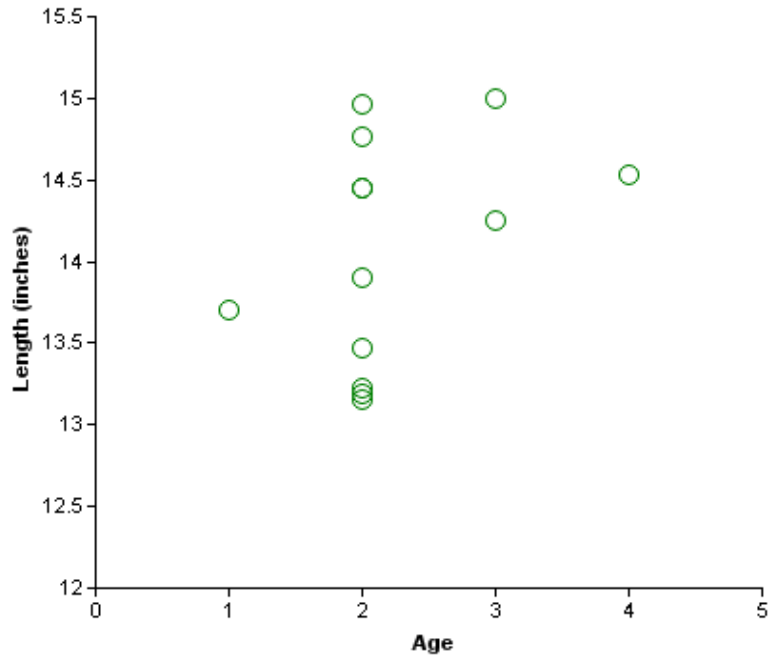
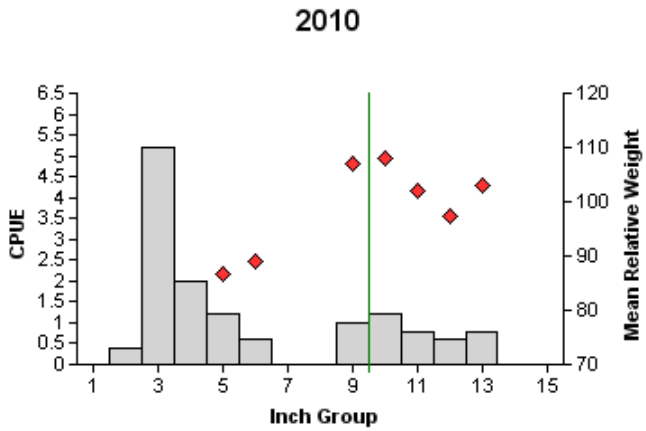


Figure 9. Length at age for Largemouth Bass (sexes combined) collected from electrofishing at Worth Reservoir, Texas, for fall 2014 (N=13).

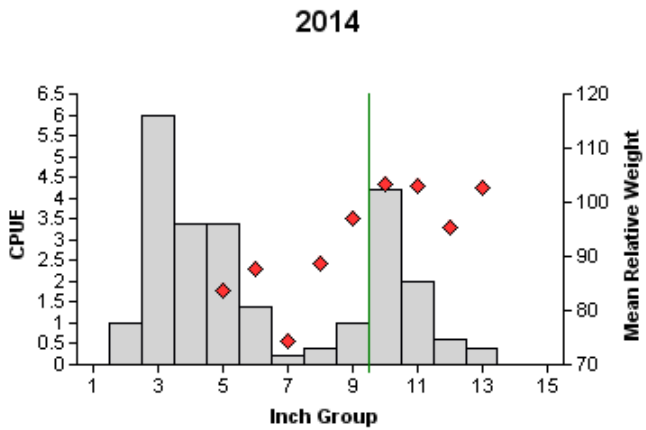
## White Crappie



Effort = 5.0  
 Total CPUE = 14.4 (41; 72)  
 Stock CPUE = 13.4 (39; 67)  
 CPUE-10 = 5.0 (49; 25)  
 PSD = 90 (2.4)



Effort = 5.0  
 Total CPUE = 13.8 (33; 69)  
 Stock CPUE = 6.2 (26; 31)  
 CPUE-10 = 3.4 (29; 17)  
 PSD = 71 (17)



Effort = 5.0  
 Total CPUE = 24.0 (27; 120)  
 Stock CPUE = 13.6 (29; 68)  
 CPUE-10 = 7.2 (31; 36)  
 PSD = 63 (11)

Figure 10. 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 net surveys, Worth Reservoir, Texas, 2006, 2010, and 2014. Vertical line represents length limit at time of sampling.

Table 6. Proposed sampling schedule for Worth Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard surveys are denoted by S and additional surveys denoted by A.

Survey year	Electrofishing Fall(Spring)	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2015-2016								
2016-2017	A							
2017-2018								
2018-2019	S, A	S	S		S	S		S

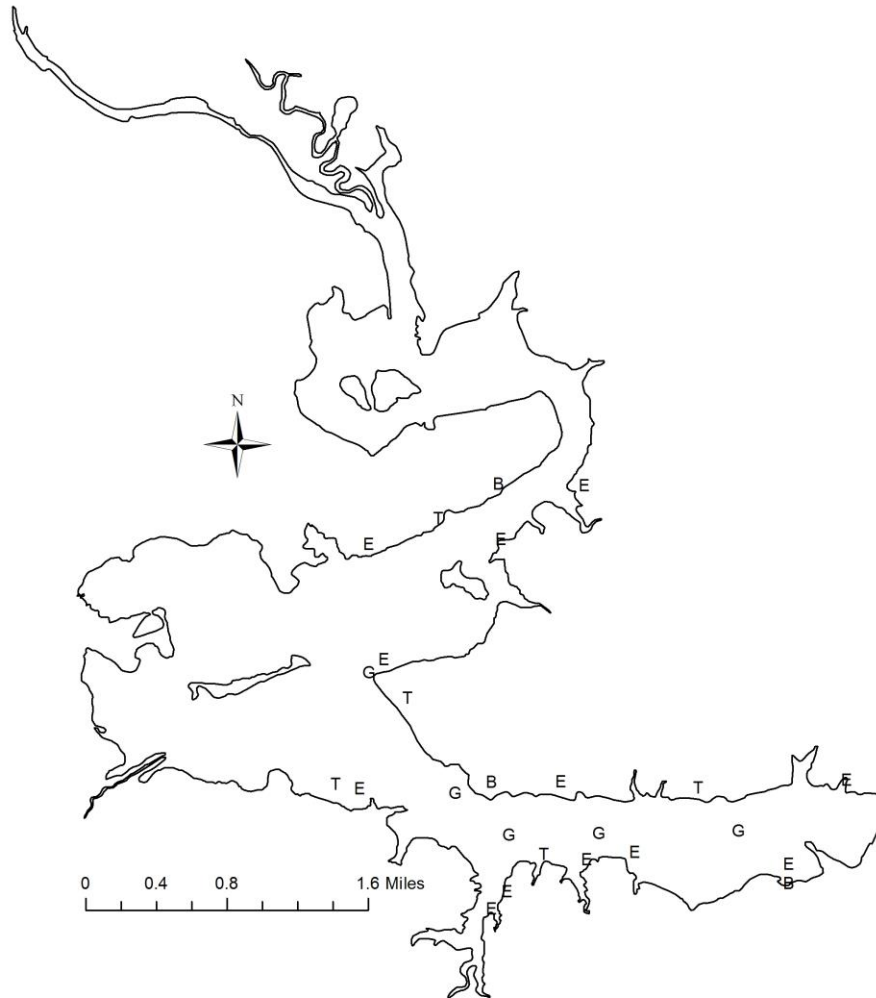
## APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Worth Reservoir, Texas, 2014-2015. Sampling effort was 5 net nights for gill netting and 5 net nights for trap netting, and 1.0 hours for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad	29	5.8			640	640.0
Threadfin Shad					260	260.0
Common Carp	10	2.0				
Smallmouth Buffalo	25	5.0				
Spotted Sucker	1	0.2				
Blue Catfish	15	3.0				
Channel Catfish	16	3.2				
White Bass	103	20.6				
Bluegill					147	147.0
Longear Sunfish					231	231.0
Redear Sunfish					1	1.0
Spotted Bass					42	42.0
Largemouth Bass					60	60.0
White Crappie	9	1.8	120	24.0		
Black Crappie			6	1.2		
Freshwater Drum	2	0.4				



## APPENDIX B



Location of sampling sites, Worth Reservoir, Texas, 2014-2015. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Boat ramps are indicated with a B. Water level was 3.4 ft below conservation pool at time of electrofishing and trap netting, and 3.0 ft below conservation pool at time of gill netting.

## APPENDIX C

Historical catch rates of targeted species by gear type for Worth Reservoir, Texas, 1990-2015. Surveys prior to 1996 utilized biologist-selected stations while those after 1996 utilized randomly-selected stations. Species averages are in bold.

Gear	Species	Year									
		1990	1992	1995	1998	2002	2003	2006	2007	2010	2011
Gill Netting (fish/net night)	Blue Catfish			3.0	0.6		2.4		2.8		9.8
	Channel Catfish	7.0	7.0	6.4	6.6		8.6		12.4		9.6
	White Bass	3.2	4.2	3.8	4.2		6.0		2.8		7.6
Electrofishing (fish/hour)	Gizzard Shad	224.0	394.0	250.7	300.0	380.0		480.0		470.0	
	Threadfin Shad	182.0	82.7	76.7	216.0	150.0		149.0		163.0	
	Bluegill	347.3	188.0	302.0	109.0	100.0		404.0		813.0	
	Longear Sunfish			245.3	108.0	66.0		334.0		334.0	
	Redear Sunfish		26.0	21.3	8.0	3.0		18.0		27.0	
	Spotted Bass		85.3	88.7	45.0	8.0		38.0		45.0	
	Largemouth Bass	80.7	189.3	185.3	152.0	43.0		118.0		146.0	
Trap Netting (fish/net night)	White Crappie	27.0	31.6	19.2	14.4	14.6		14.4		13.8	
	Black Crappie	0.2	0.0	1.6	1.4	0.0		0.0		4.6	

## APPENDIX C continued.

Gear	Species	Year		
		2014	2015	Ave
Gill Netting (fish/net night)	Blue Catfish		3.0	<b>3.6</b>
	Channel Catfish		3.2	<b>7.6</b>
	White Bass		20.6	<b>6.6</b>
Electrofishing (fish/hour)	Gizzard Shad	640.0		<b>392.3</b>
	Threadfin Shad	260.0		<b>159.9</b>
	Bluegill	147.0		<b>301.3</b>
	Longear Sunfish	231.0		<b>219.7</b>
	Redear Sunfish	1.0		<b>14.9</b>
	Spotted Bass	42.0		<b>50.3</b>
	Largemouth Bass	60.0		<b>121.8</b>
Trap Netting (fish/net night)	White Crappie	24.0		<b>19.9</b>
	Black Crappie	1.2		<b>1.1</b>