PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-2

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2016 Fisheries Management Survey Report

Medina Reservoir

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July 31, 2017

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Medina Reservoir were surveyed using electrofishing in 2016 and gill netting in 2017. Historical data are presented with the 2016-2017 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Medina Reservoir (5,410 acres) was constructed in 1913 and is located on the Medina River in Medina and Bandera counties, Texas. It was built for irrigation water supply. The reservoir experienced a considerable water level increase in 2015 filling to conservation pool elevation from 80 feet low. As a result, boat ramps re-opened. Most of the shoreline is characterized as rock bluff or rocks and gravel. Flooded terrestrial vegetation is currently the predominant fisheries habitat type.

- **Management History:** Important sport fish include Largemouth Bass, Palmetto Bass, and White Bass. All species have been managed under statewide regulations. Florida Largemouth Bass fingerlings have been stocked infrequently and most recently in 2016 when fisheries habitat was optimal for survival. Palmetto Bass have been stocked on an irregular basis due to variable availability and water level fluctuations.

- **Fish Community**
  - **Prey species:** Gizzard Shad, Threadfin Shad, and sunfish spp., primarily Bluegill, comprise the prey community. Gizzard Shad abundance increased immediately after reservoir refill and then decreased. Bluegill abundance has continued to increase. These species were sufficiently abundant as a group, and sufficiently sized to support existing predators.

  - **Catfishes:** Both Blue Catfish and Channel Catfish abundance has remained consistently low. Blue Catfish population size structure has improved, whereas Channel Catfish population size structure was poor.

  - **White Bass:** Abundance was lower in 2017 than in 2011 when water level was lower by about 25 feet. The majority of fish collected in 2017 exceeded 10 inches total length (TL), and all sizes of fish exhibited good body condition.

  - **Palmetto Bass:** Abundance was lower in 2017 than in 2011. Fish collected in 2017 ranged in size from 12 to 23 inches. Smaller individuals likely resulted from the most recent stocking which was conducted in 2016 following reservoir refill in 2015. The larger fish collected in 2017 were likely from stockings conducted in 2011, prior to the prolonged low-water level event.

  - **Largemouth Bass:** Relative abundance increased tremendously following reservoir refill in 2015. Florida genotype fish represented a greater fraction of the population in 2016 (17%) than in 2012 (3%). The population is mostly comprised of sub-legal length fish. Growth was moderate and could have been negatively influenced by high fish density. Age-0 and age-1 fish averaged 5.5 and 11.0 inches TL, respectively, in 2016.

Management Strategies: Maintain the Palmetto Bass fishery by annually stocking 5-15 fish/acre. Inform the public about the negative impacts of aquatic invasive species, and monitor for presence of aquatic invasive species during routine fish population and habitat surveys.

INTRODUCTION

This document is a summary of fisheries data collected from Medina Reservoir in 2016-2017. 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 2016-2017 data for comparison.

Reservoir Description

Medina Reservoir (5,410 acres) was constructed in 1913, is located on the Medina River in Medina and Bandera counties, Texas, and was built to support downstream agricultural irrigation needs. In 2000, the San Antonio Water System obtained rights to 19,974 acre-feet of released water for drinking water. The reservoir is characterized as deep, having an average depth of 46 feet, and relatively infertile with a secchi depth that exceeds 6 feet. Water level was 85 feet below conservation pool elevation (CP) in 2013 and 2014 before refilling in 2015 (Figure 1). Most of the shoreline (75%) is characterized as rock bluff or rocks and gravel. Boat docks occur along 24% of the shoreline when the reservoir is near CP. The reservoir contained no aquatic vegetation in 2016. Other descriptive characteristics for Medina Reservoir are in Table 1.

Angler Access

Medina Reservoir has one public boat ramp and two private boat ramps (Table 2). The public ramp is located near the middle of the reservoir in Bandera County and both private ramps are near the dam. None of the boat ramps were functional from 2013 to spring 2015 because of low water level. All ramps re-opened following the substantial water level increase in 2015. Bank-angling opportunity is very limited, occurring at only the public ramp when water level is within 25 feet of CP.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Myers and Dennis 2012) included:

1. Provide a Palmetto Bass fishery when water level increases to appropriate level.
   Action: Palmetto Bass fingerlings (N= 46,662 fish) were stocked in 2016.
2. Improve the quantity and quality of the Largemouth Bass population through stocking when water level increases to appropriate level.
   Action: A total of 203,768 Florida Largemouth Bass (FLMB) fingerlings (38 fish/acre) were stocked in 2015.
3. Monitor for aquatic invasive species.
   Action: No aquatic invasive species were found during fish and habitat sampling in 2016-2017.

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

Stocking history: Stockings of Palmetto Bass and FLMB have been sporadic during the last two decades, due primarily to periods of extreme low water level. Palmetto Bass, FLMB, and Blue Catfish were stocked following reservoir refill in 2015. The complete stocking history is in Table 4.

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

Water transfer: No inter-basin transfers are known to exist.

METHODS

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan found in this report. Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected (Appendix A) and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.5 h at 18, 5-minute stations) in 2012 and 2016. Less electrofishing effort was used in 2015 (0.8 h at 9, 5-minute stations) due to the high and consistent numbers of fish collected which yielded sufficient estimate precision. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths. An insufficient number of 13-15 inch Largemouth Bass (N = 5) were collected to determine average age at 14 inches total length (TL). However, sufficient numbers of fish were collected to determine average TL by age.

Gill netting – Channel Catfish, Blue Catfish, White Bass, and Palmetto Bass were collected by gill netting (10 net nights at 10 stations) during spring in 2011 and 2017. Less gill net effort (5 net-nights at 5 stations) was expended in spring 2013 because of the extreme low water level reducing reservoir size to about 950 acres. Gill net sampling was not conducted in spring 2015 due to extreme low water level (>80 ft. low) preventing access. Gill netting CPUE was recorded as the number of fish caught per net night (fish/nn). Palmetto Bass and White Bass were not aged because ages of fish collected in 2017 could be easily discerned as being born or stocked before or after the prolonged period of extreme low water level from length distributions and stocking records.

Genetics – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Micro-satellite DNA analysis was used to determine genetic composition of individual fish.

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics.

Habitat – A habitat/vegetation survey was conducted in 2016 using the random point sampling method according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Water level – The source for water level data was the United States Geological Survey website (USGS 2017).

RESULTS AND DISCUSSION

Habitat: Reservoir refill after the extended period of low water level (Figure 1) yielded a large-scale improvement to fisheries habitat. Flooded terrestrial vegetation was the primary habitat type and was present in 46% of the reservoir in 2016 (Table 6). A shoreline structural survey was not conducted as no significant shoreline modifications took place since the 2005 shoreline structural survey was completed by Myers and Dennis (2004).

Prey species: Electrofishing CPUE of Gizzard Shad increased considerably coincident with reservoir refill to 186.7 fish/h in 2015 and declined shortly thereafter to 44.7 fish/h in 2016, likely due to predation by highly abundant Largemouth Bass (Figure 2). Gizzard Shad IOV declined from 57 in 2015 to 36 in 2016 indicating that proportionally fewer fish were sufficiently-sized as prey for predators. Threadfin Shad electrofishing CPUE was low (10.6 fish/h) in 2016 (Appendix B). In contrast, electrofishing CPUE of Bluegill increased throughout the study period from a low of 94.7 fish/h in 2012 to a high of 302.0 fish/h in 2016 (Figure 3). The majority of the Bluegill population in 2016 was comprised of fish $\leq$4 inches TL, an ideal prey size for Largemouth Bass.

Blue Catfish: Gill net CPUE of Blue Catfish was similar throughout the study period ranging from 1.5 fish/nn in 2017 to 1.8 fish/nn in 2013 (Figure 4). However, population size structure was improved following the 2015 reservoir refill (PSD= 82 in 2017) compared to in 2013 (PSD=33). Likewise, Blue Catfish body condition was improved in 2017 (W_r >90 for most length classes) compared to 2013 ($W_r \leq 90$ for most length classes). Blue Catfish fingerlings were stocked in 2015. These fish likely experienced high survival due to optimum habitat conditions and thus contribute to the current population abundance.

Channel Catfish: Gill net CPUE of Channel Catfish remained low in the reservoir during the study period, ranging from 0.2 fish/nn in 2013 to 1.7 fish/nn in 2011 (Figure 5). The majority of Channel catfish collected in 2017 were sub-stock size.

White Bass: Gill net CPUE of White Bass was lower in 2017 (1.4 fish/nn) than in 2013 (2.2 fish/nn) and 2011 (3.0 fish/nn; Figure 6). The majority of fish captured in 2017 (11 of 14) exceeded the minimum size limit ($\geq$10 inches total length) with all fish exhibiting good condition ($W_r \geq 85$).

Palmetto Bass: Gill net CPUE in 2017 (1.5 fish/nn) was greater than in 2013 (0.4 fish/nn) and lower than in 2011 (3.7 fish/nn; Figure 7). Fish collected in 2017 ranged in size from 12 to 23 inches, with smaller individuals likely a result of the most recent stocking conducted in 2016 following reservoir refill. The larger fish collected in 2017 were likely from stockings conducted before the prolonged low water event (2011) as average age of legal length Palmetto Bass in Medina was found to be 3.2 years (Myers and Dennis 2012). Condition (W_r) and PSD in 2017 was similar to what they were in 2011.

Largemouth Bass: Electrofishing CPUE of Largemouth Bass was considerably higher in 2015 (340.0 fish/h) and 2016 (101.3 fish/h) than in 2012 (27.3 fish/h; Figure 8). Electrofishing CPUE was likewise high in spring 2016 (130.5 fish/h; Figure 9). This substantial increase in Largemouth Bass relative abundance is likely a product of 1) the dramatic increase in the quantity and quality of littoral habitat resulting from reservoir refill, and 2) survival of FLMB fingerlings stocked in 2015 as suggested by the large increase in % FLMB in 2016 (17.0) compared to 2012 (3.0). Although stock size fish comprised 46-69% of the electrofishing catch in 2015-2016, proportionally very few quality size fish ($\geq$12 inches TL) were present in the population (PSD= 3-17). In 2016, Largemouth Bass condition remained good suggesting adequate forage, with $W_r \geq 90$ for all length classes. Florida Largemouth Bass influence was 59% in 2016 which was in line with 2012 FLMB introgression (Table 7). Largemouth Bass growth is typically slow to moderate at this reservoir. Average age of 13-15 inch largemouth bass (N = 10 fish) was 2.9 years in 2004 (Myers and Dennis, 2004). Age-0 and Age-1 fish collected in 2016 averaged 5.5 inches TL (N=24) and 11.0 inches TL (N=30), respectively.

Fisheries management plan for Medina Reservoir, Texas

Prepared – July 2017

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

MANAGEMENT STRATEGY

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

ISSUE 2: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. 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 through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule 2017-2021

Sport fish, forage fish, and other important fishes: Primary sport fishes in Medina Reservoir are Largemouth Bass, Hybrid Striped Bass, and White Bass. Blue Catfish and Channel Catfish are also present and contribute to the fishery. Known important forage species include Bluegill and Gizzard Shad.

Survey objectives, fisheries metrics, and sampling objectives:

Gizzard Shad and Bluegill: Electrofishing CPUE of Gizzard Shad was fairly consistent from 2004 to 2012 ranging from 39.3 to 56.7 fish/h (RSE=30-49). During the same period, electrofishing CPUE of Bluegill was variable ranging from 94.7 to 280.7 fish/h (RSE=15-38). The level of sampling effort used (18 stations) provided adequate inference and precision for detecting large-scale changes in these populations (RSE $\leq$50). Sampling of these species will continue to be conducted at 18 random sites at night during fall. No additional effort will be expended to increase the number of Bluegill or Gizzard Shad collected or reduce RSEs. Sampling will occur once every four years and the next sample will be fall 2020 (Table 8).

Blue and Channel catfishes: Historically (2003-2004), 19% of the angling effort on the reservoir targeted catfishes. Gill net sampling has been conducted every other year using 10 net-nights. Blue Catfish CPUE ranged from 1.7 to 1.8 fish/nn from 2009 to 2011 (RSE=18-36, N=17-18). Channel Catfish CPUE ranged from 0.8 to 1.7 fish/nn from 2009 to 2011 (RSE=26-52, N=8-17). The low-density nature of these populations and highly dynamic water level fluctuations at Medina (up to 50 ft. annually) makes it difficult to consistently achieve precise CPUE estimates (RSE $\leq$25). Sampling effort of 20-40 net-nights would be needed to achieve 80% of the time, a Channel Catfish CPUE estimate with an RSE $\leq$25. Nevertheless, existing data show that the current sampling protocol is sufficient for evaluating for large-scale changes in population abundance and will provide sufficient estimate precision (RSE $\leq$50) in most years. This remains our primary sampling objective for catfishes. Designation of specific sampling objectives for size structure and growth metrics for these species is currently unnecessary due to the low density nature of these populations. Gill net sampling will occur once every four years using 10 net-nights of effort at random stations. No additional gill net sampling effort will be used in the event RSE exceeds 50 for CPUE. The next sampling event will be in spring 2021.

Palmetto and White basses: Historically (2003-2004), 21% of the angling effort on the reservoir targeted temperate basses. Sampling success for Palmetto Bass is in part a function of stocking density and frequency as this species is not self-sustaining. Palmetto Bass were stocked during years when water level was conducive for such. Stockings occurred about every other year prior to 2012. Extreme low water level (>50 ft. low) from 2012 to spring 2015 precluded stocking. Water level returned to near full pool in 2015, and Palmetto Bass fingerlings (N=46,662; 9 fish/acre) were stocked in 2016. Gill net sampling has been conducted every other year using 10 net-nights to assess both species. Palmetto Bass CPUE was 5.4 fish/nn (RSE=49, N=54) in 2009 and 3.7 fish/nn (RSE=37, N=37) in 2011. White Bass CPUE was 2.0 fish/nn (RSE=47, N=20) in 2009 and 3.0 fish/nn (RSE=43, N=30) in 2011. Sampling effort of 40-50 net-nights would be needed to achieve a Hybrid Striped Bass CPUE estimate having a RSE $\leq$25, 80% of the time. Existing data show that the current sampling protocol is sufficient for evaluating for large scale changes in population abundance, general success of stockings, and will provide sufficient estimate precision (RSE $\leq$50) in most years. This remains our primary sampling objective for temperate basses. Because the number of Hybrid Striped Bass available for stocking is limited, population size structure and growth information is important for stocking justification. As such, a minimum target of 25 fish will be used to accommodate size structure and growth analyses (age all fish). This number of fish will result in adequate inference about annual relative stocking success, the presence of legal harvestable size, and the number of years necessary to attain such size. Gill net sampling will occur once every four years using 10 net-nights of effort at random stations. No additional gill net sampling effort will be used in the event RSE exceeds 50 for CPUE and less than 25 Hybrid Striped Bass are collected. The next sampling event will be in spring 2021.

Largemouth Bass: Historically (2003-2004), 43% of the angling effort on the reservoir targeted Largemouth Bass. Electrofishing sampling has been conducted every fourth year at 18 random stations from 2000 to 2012. Largemouth Bass CPUE ranged from 59 to 113 fish/h and associated RSE ranged from 16-18 in all years except 2012 (CPUE=27, RSE=40). Water level was considerably lower in 2012 than in previous years (about 60 feet below full pool), making the 2012 data an outlier. Existing data shows that the current sampling protocol is sufficient for evaluating for large scale changes in population abundance and will provide adequate estimate precision in most years(RSE $\leq$25). This remains our primary sampling objective for Largemouth Bass. Because this species accounts for the most angling effort on the reservoir and harvest regulation changes are often used to manage this species, size structure and growth information are important. As such, a minimum target of 30 stock-size fish will be used to accommodate a reliable size structure analysis (i.e. PSD). Specifically for growth, 13 fish ranging in size from 13-15 inches will be aged to determine average years to attain 14 inches in length. This number of fish will result in adequate inference about the presence of legal harvestable length fish, and the number of years necessary to attain such length. Electrofishing sampling will occur once every four years at 18 random stations during nighttime. No additional electrofishing sampling effort will be used in the event RSE exceeds 25 for CPUE or if the number of fish collected for size structure analysis and growth is less than targeted. The next sampling event will be in fall 2020.

Low Density fisheries:

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

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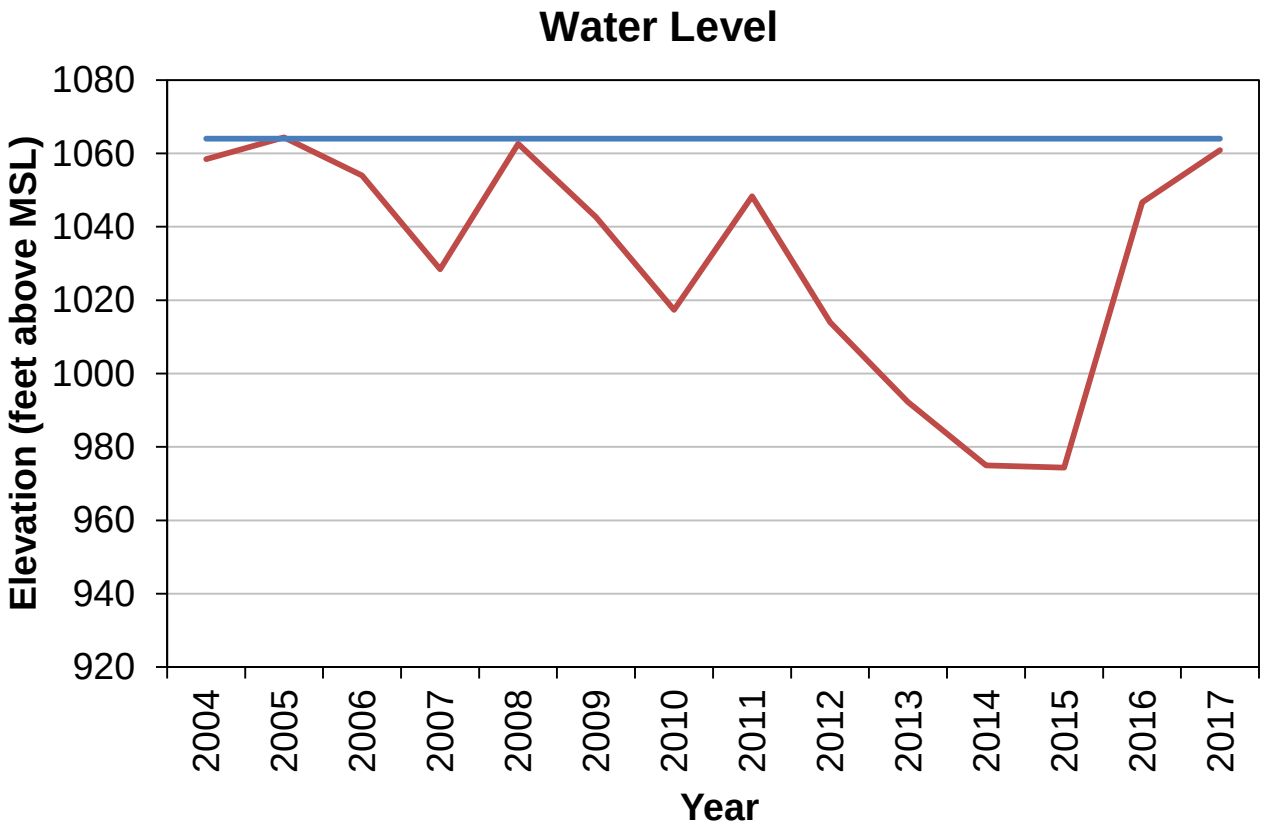


Figure 1. Average quarterly water level elevations in feet above mean sea level (MSL) recorded for Medina Reservoir, Texas. Conservation level (blue line) is 1,064.2 feet above MSL.

Table 1. Characteristics of Medina Reservoir, Texas.

Characteristic	Description
Year constructed	1913
Controlling authority	Bexar Medina Atascosa Counties Water Improvement District No. 1
County	Medina and Bandera
Reservoir type	Main stream
Shoreline Development Index (SDI)	10.5
Conductivity	388 µS/cm

Table 2. Boat ramp characteristics for Medina Reservoir, Texas, March, 2017. Reservoir elevation at time of survey was 1,061 feet above mean sea level which is 3 feet below conservation pool elevation.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Bandera County Park	29.56438 -98.95469	Y	20	unknown	2-lane concrete, good
Red's Cove	29.54719 -98.9274	N	30	unknown	2-lane concrete, good
Joe's Marina	29.542762 -98.929256	N	15	unknown	1-lane concrete, good

Table 3. Harvest regulations for Medina Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Palmetto	5	18-inch minimum
Bass, Largemouth and Smallmouth	5 (in any combination)	14-inch minimum
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

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

Species	Year	Number stocked	Size
Blue Catfish	1974	186,750	NR
	1975	3,000	NR
	2015	66,528	FGL
	Total	256,278	
Channel Catfish	1967	2,750	NR
	2007	185,271	FGL
	Total	188,021	
Florida Largemouth Bass	1976	65,000	FGL
	1977	59,950	FRY
	1978	99,901	FGL
	2003	276,179	FGL
	2005	271,158	FGL
	2015	203,768	FGL
	Total	975,956	
Largemouth Bass	1967	7,500	NR
	1971	70,000	NR
	Total	77,500	
Palmetto Bass	1977	60,400	NR
	1979	59,968	NR
	1983	55,450	NR
	1994	61,300	FGL
	1995	92,700	FGL
	1996	85,900	FGL
	1997	83,971	FGL
	1998	56,304	FGL
Palmetto Bass *continued*	1999	41,897	FGL
	2000	5,550	FGL
	2002	42,146	FGL
	2004	42,281	FGL
	2005	81,265	FGL
	2007	23,859	FGL
	2008	54,586	FGL
	2011	28,180	FGL
	2016	46,662	FGL
	Total	922,419	
Smallmouth Bass	1977	60,850	NR
	1979	51,725	NR
	1987	22,630	FGL
	1988	78	ADL
	1988	106,594	FRY
	Total	241,877	
Walleye	1973	640,000	NR
	1974	134,750	NR
	Total	774,750	NR
Warmouth	1967	47,000	NR
	Total	47,000	NR

Table 5. Objective-based sampling plan components for Medina Reservoir, Texas, 2016-2017.

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

[a] No additional effort beyond the 10 gill nets will be expended in the event fewer than 25 Hybrid Striped Bass are collected.
[b] No additional effort beyond 18 5-minute night time electrofishing stations will be expended to collect 30 stock sized Largemouth Bass or 13 Largemouth Bass between 13.9 and 15 inches.
[c] No additional effort will be expended to achieve an RSE ≤ 50 for CPUE of Bluegill and Gizzard Shad if not reached from designated electrofishing sampling effort. Instead, growth and body condition of other sport fishes can provide information on forage abundance and vulnerability.

Table 6. Percent occurrence of habitat, with lower and upper 95% confidence limits (CL), at 124 random sites in Medina Reservoir, Texas, August, 2016. Water level at time of survey was 1,063.6 feet above mean sea level (1 foot low).

Habitat/vegetation type	Percent occurrence	Lower CL	Upper CL
Open water	53.2	44.0	62.2
Flooded terrestrial vegetation	46.0	37.2	54.7
Standing timber	0.8	<0.1	4.4

Gizzard Shad

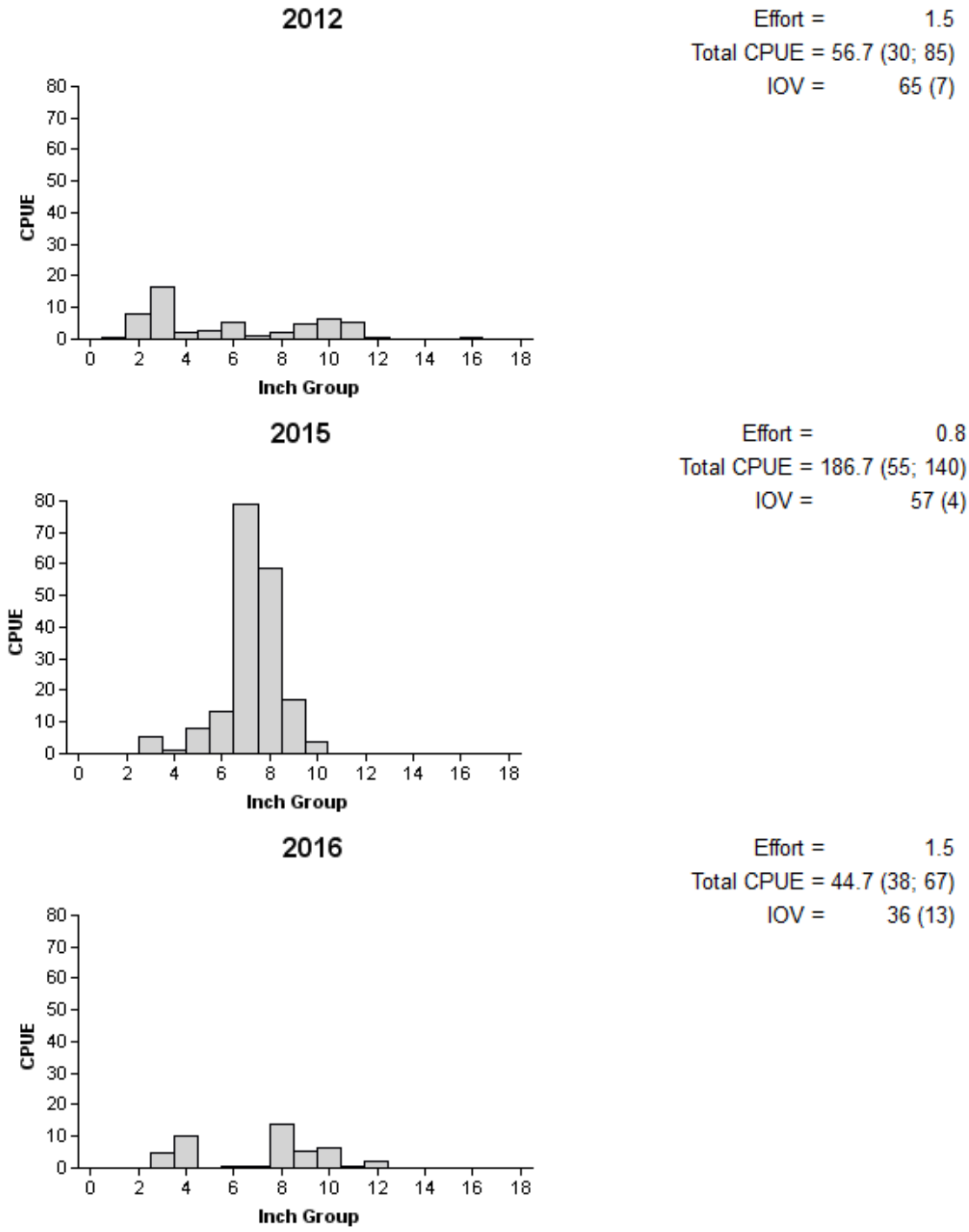


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Medina Reservoir, Texas, 2012, 2015, and 2016.

Bluegill

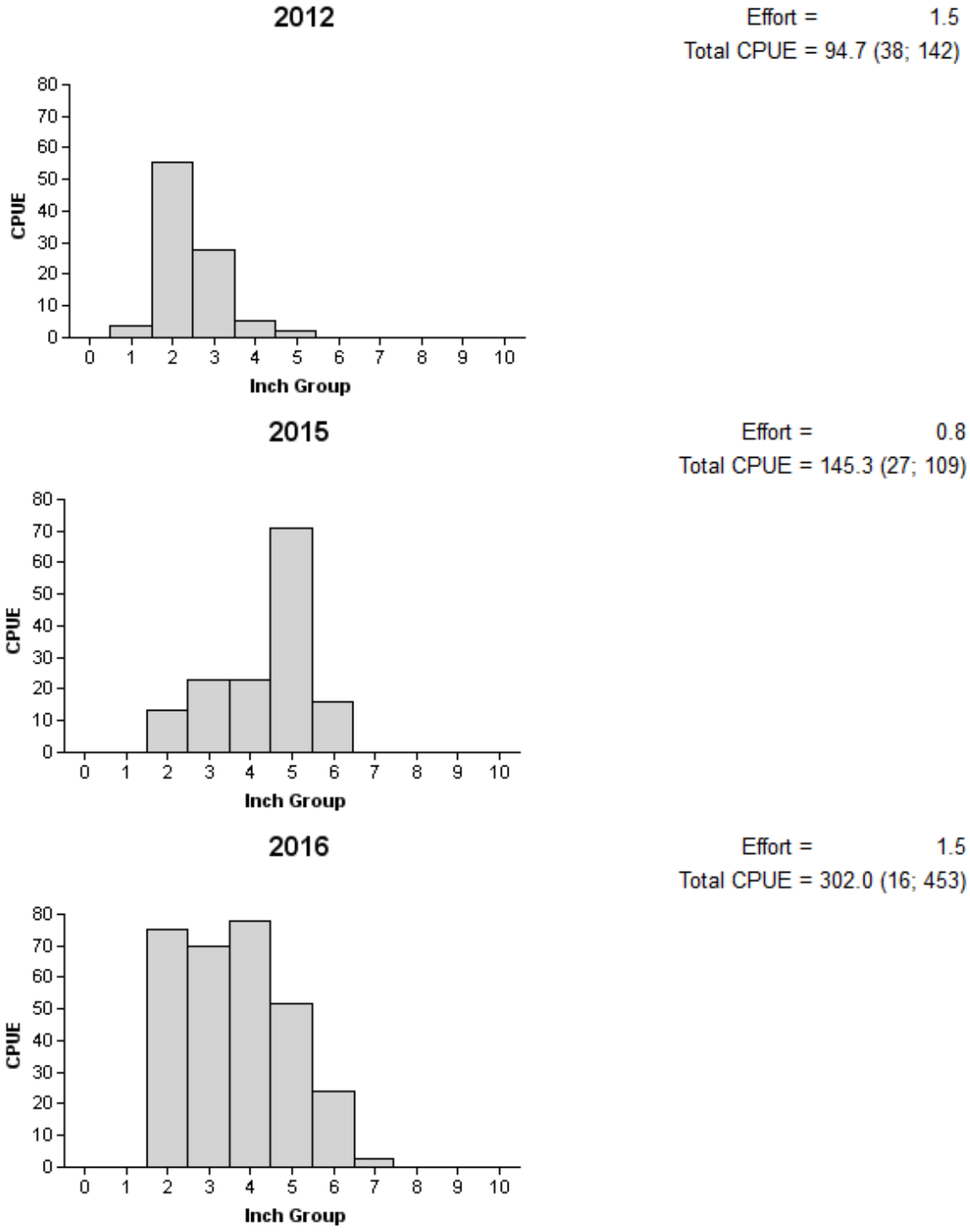


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Medina Reservoir, Texas, 2012, 2015, and 2016.

Blue Catfish

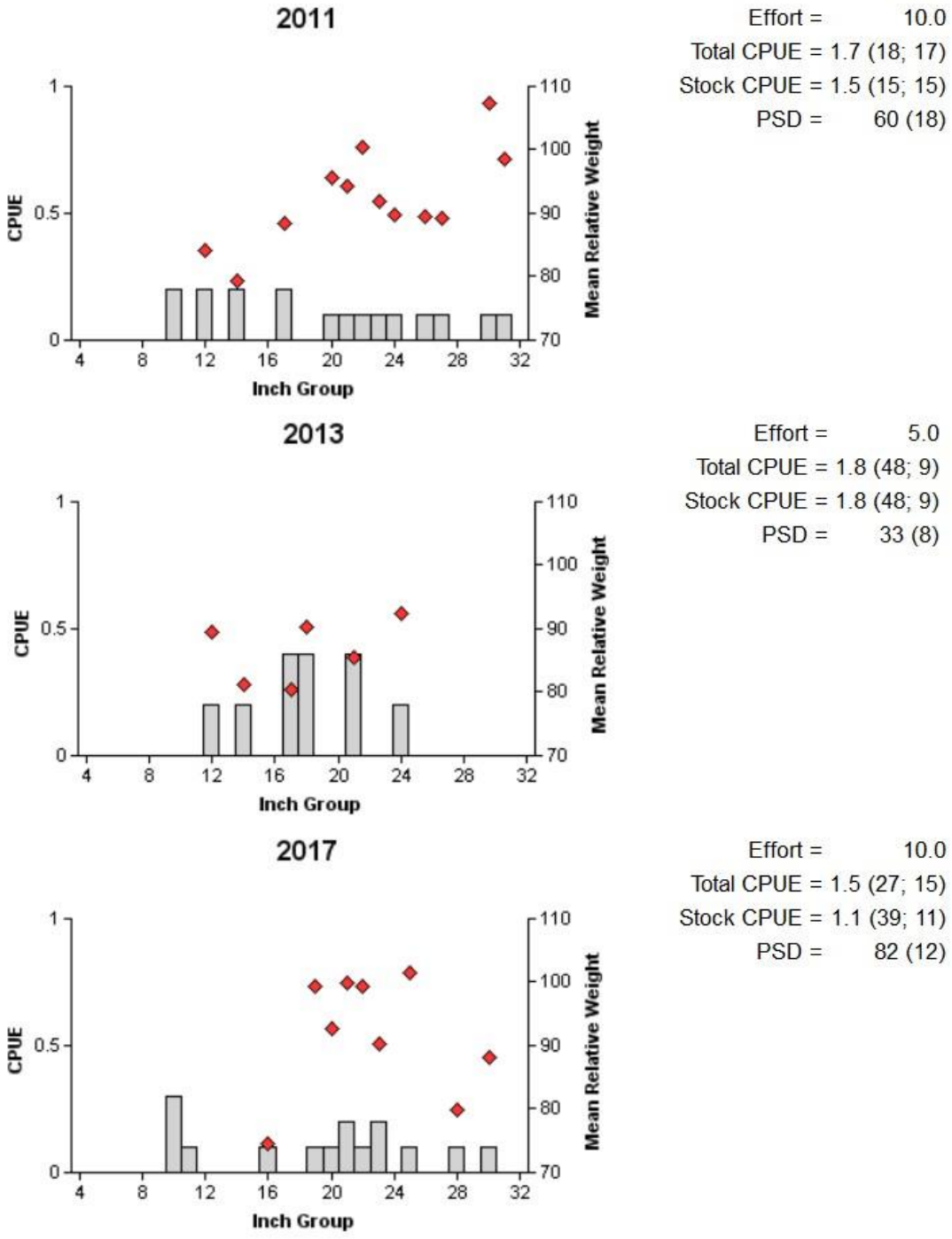


Figure 4. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2011, 2013, and 2017.

Channel Catfish

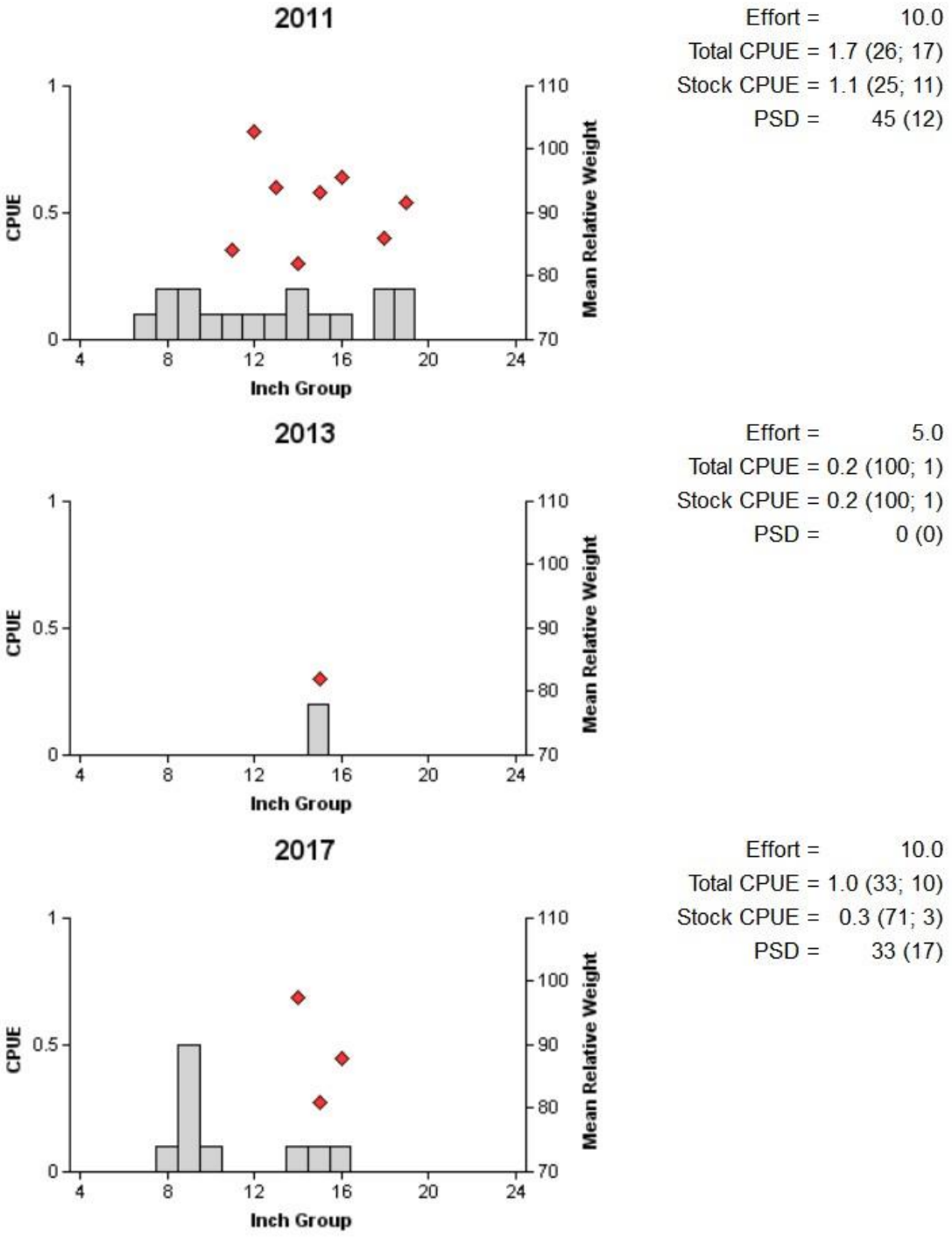


Figure 5. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2011, 2013, and 2017.

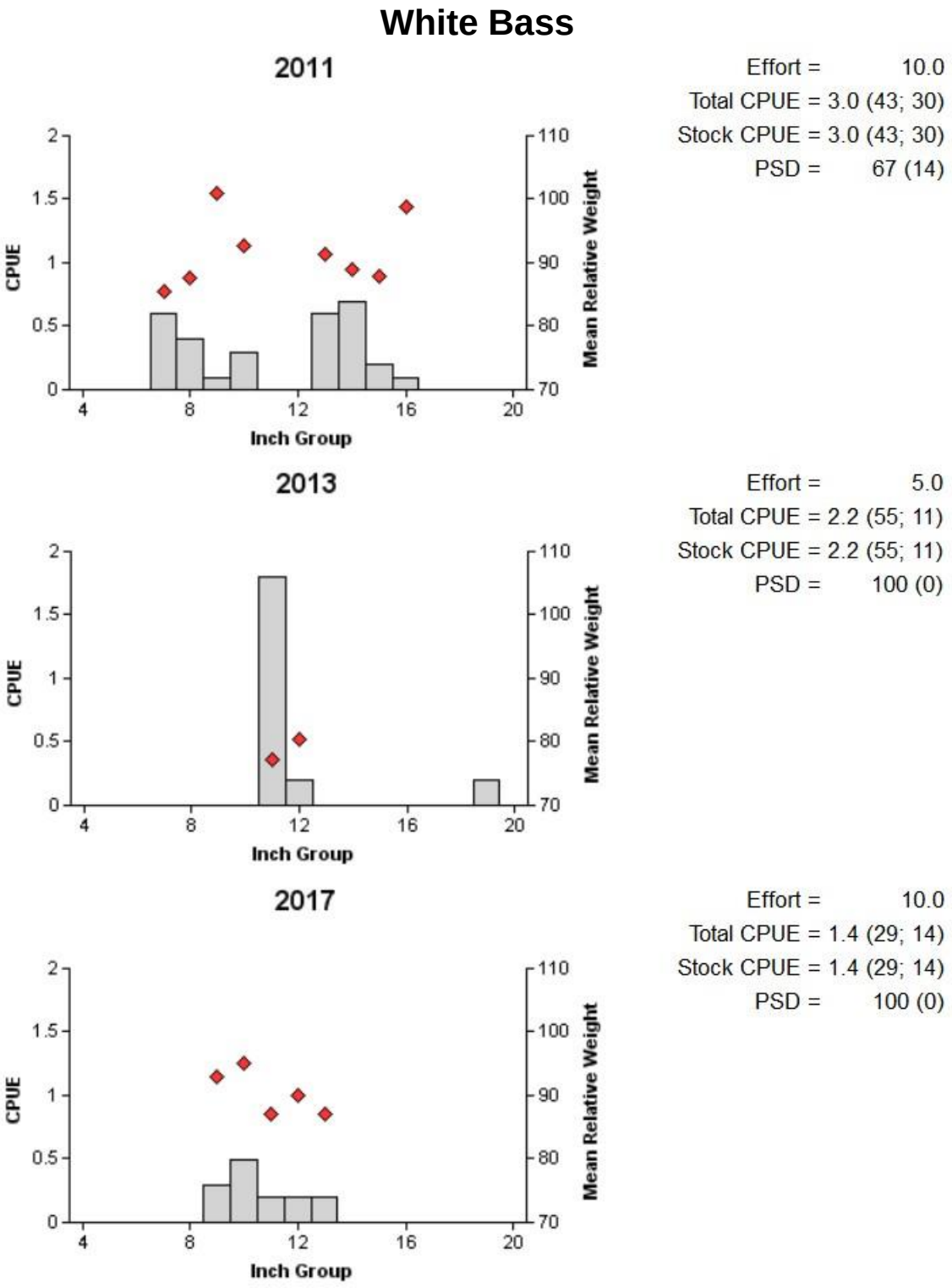


Figure 6. Number of White Bass caught per net night (CPUE) and population indices (RSE and N are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2011, 2013, and 2017.

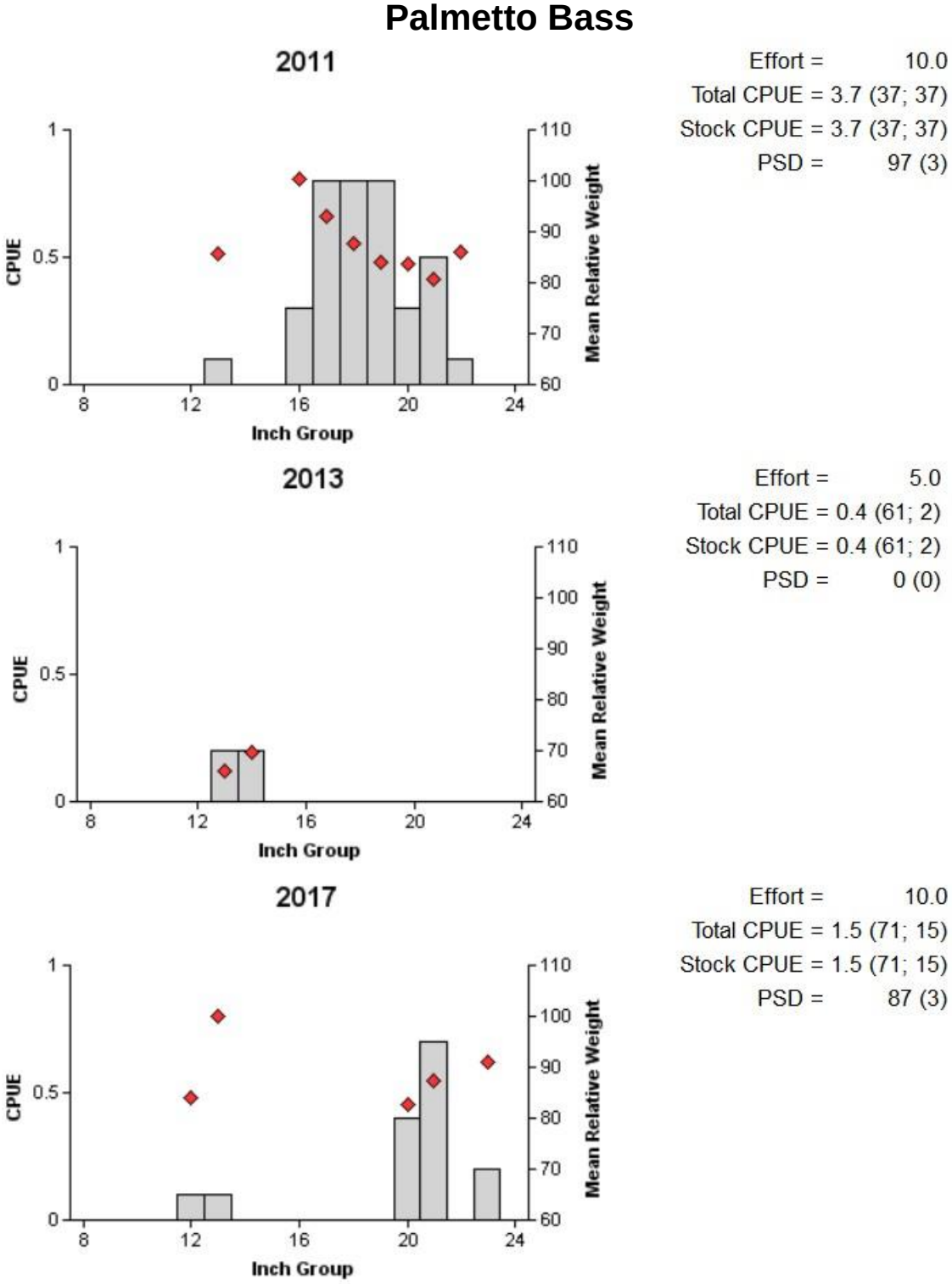


Figure 7. Number of Palmetto Bass caught per net night (CPUE) and population indices (RSE and N are in parentheses) for spring gill net surveys, Medina Reservoir, Texas, 2011, 2013, and 2017.

Largemouth Bass

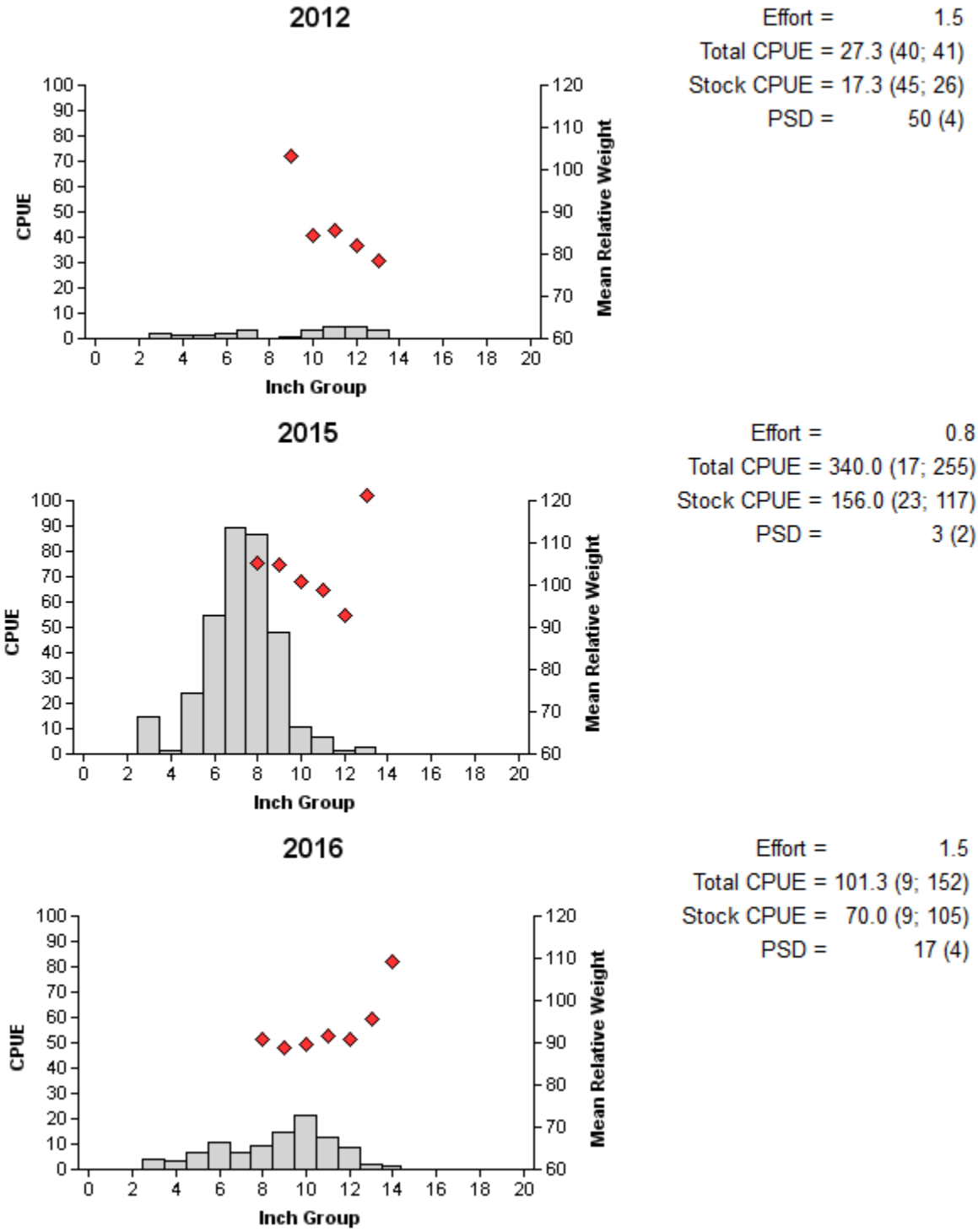


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Medina Reservoir, Texas, 2012, 2015, and 2016.

Largemouth Bass

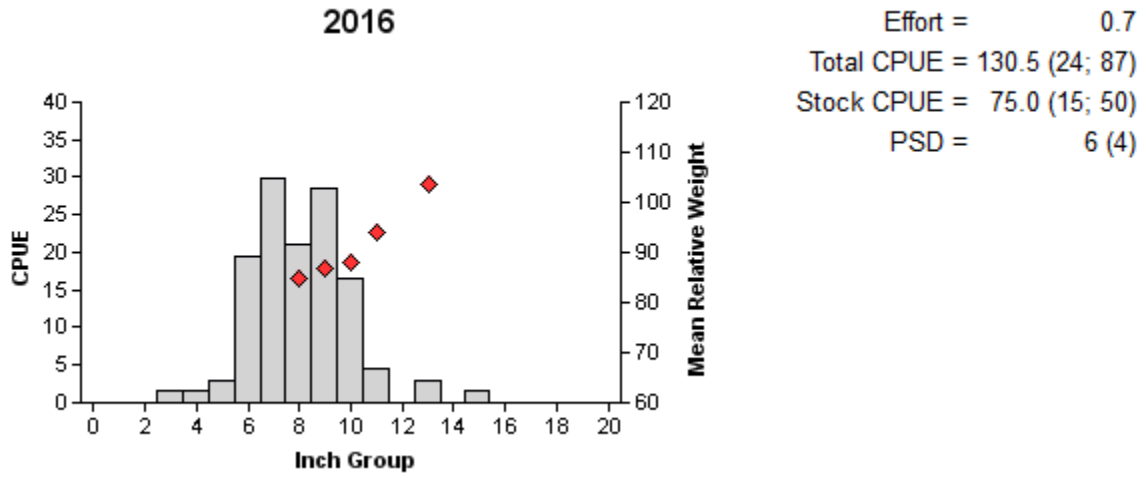


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Medina Reservoir, Texas, 2016.

Largemouth Bass

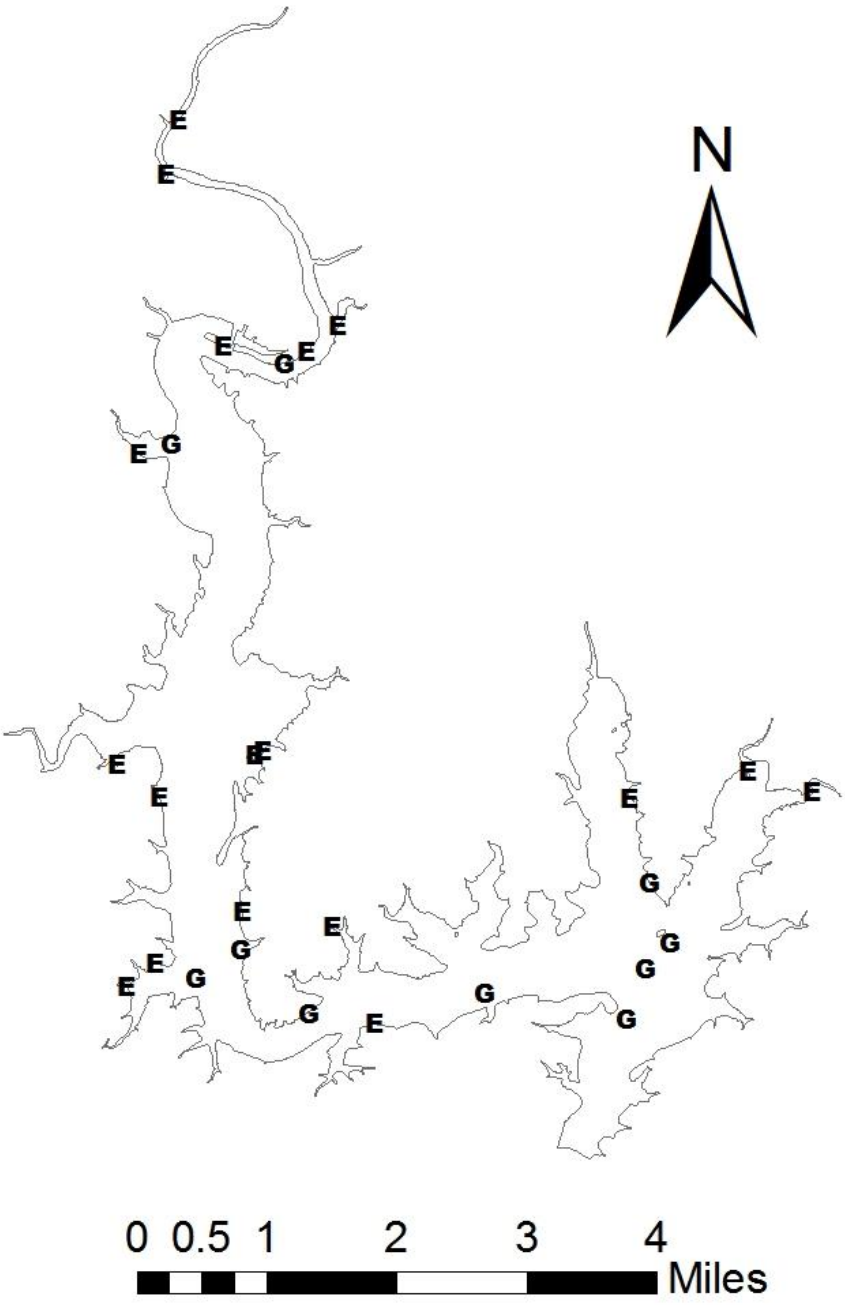
Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Medina Reservoir, Texas, 2012 and 2016. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined using micro-satellite DNA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

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

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

Survey year	Electrofish	Trap net	Gill net	Habitat		Access	Creel survey	Report
				Structural	Vegetation			
2017-2018								
2018-2019								
2019-2020								
2020-2021	S		S		S	S		S

APPENDIX A



Location of sampling sites Medina Reservoir, Texas, 2016-2017. Gill net and electrofishing stations are indicated by G, and E, respectively. Water level was near conservation pool elevation at time of sampling.

APPENDIX B

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Medina Reservoir, Texas, 2016-2017. Sampling effort was 10 net nights for gill netting and 1.5 hours for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Longnose Gar	2	0.2		
Gizzard Shad	106	10.6		
Threadfin Shad			16	10.7
Common Carp	42	4.2		
Gray Redhorse	4	0.4	5	3.3
Blue Catfish	15	1.5		
Channel Catfish	10	1.0		
Flathead Catfish	2	0.2		
Mexican Tetra			2	1.3
White Bass	14	1.4		
Palmetto Bass	15	1.5		
Redbreast Sunfish			1	0.7
Green Sunfish			10	6.7
Bluegill	5	0.5	453	302.0
Longear Sunfish			22	14.6
Redear Sunfish			5	3.3
Smallmouth Bass			1	0.7
Largemouth Bass	56	5.6	152	101.3
White Crappie	30	3.0		
Black Crappie	3	0.3		
Rio Grande Cichlid			2	1.3