PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2013 Fisheries Management Survey Report

Choke Canyon Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations were surveyed in 2013 using electrofishing and trap netting and in 2014 using gill netting to assess population trends for important sport fishes. Anglers were surveyed from 1 June 2013 to 31 May 2014. Historical data are presented with the 2013-2014 data for comparison. This report summarizes the survey results and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Choke Canyon is a 25,989-acre reservoir (averaged 14,393 acres in 2013-2014) located on the Frio River in the Nueces River Basin, approximately 80 miles south of San Antonio. Its main purposes are water supply and recreation (angling and pleasure boating). The reservoir has a history of substantial water level fluctuations. The substrate is composed primarily of silt, sand, clay, and some gravel/rock. Littoral habitat consisted of native aquatic vegetation, periodically flooded terrestrial vegetation, standing timber, and seasonally abundant water hyacinth and hydrilla.

- **Management History:** Important sport fish species include Largemouth Bass, Blue and Channel Catfishes, White Bass, and White Crappie. Recent management efforts have focused on control of nuisance aquatic vegetation, compiling catch and harvest statistics on important sport fish species, documenting catch of trophy Largemouth Bass, and supplementing the naturally occurring Largemouth Bass population through stockings in 2009-2011 and 2013. The district has worked with the City of Corpus Christi to develop and implement a water hyacinth control program. District staff conducted herbicide treatments on water hyacinth in 2008 (195 acres), 2009 (80 acres), 2010 (525 acres) and 2011 (45 acres). Staff annually monitored access areas where hydrilla could restrict use. No vegetation control activities were needed in 2012 or 2013. Angler harvest of all sport fishes has been regulated according to statewide size and bag limits.

- **Fish Community**
  - **Prey species:** Gizzard and Threadfin Shad and Bluegill formed the reservoirs forage base. Population size structure of prey species was suitable to support sport fish populations.

  - **Alligator Gar:** Abundance and size structure of Alligator Gar was excellent. The population provided anglers the opportunity for trophy-sized catches.

  - **Catfishes:** Blue Catfish abundance remained high. Channel and Flathead Catfish were also present, but in low numbers. Blue Catfish size structure comprised a wide size-range of fish.

  - **White Bass:** Abundance and size structure of White Bass was poor in 2014; however, all fish collected were > 10 inches and thus available for angler harvest.

  - **Largemouth Bass:** Largemouth Bass relative abundance declined over the survey period. Mean age at legal length was 2.8 years. Largemouth Bass continued to be the most sought species in the reservoir. Numerous trophy-sized Largemouth Bass were caught and documented in creel surveys.

  - **Crappie:** White Crappie was the predominant crappie species. Relative abundance, while low, was consistent with previous surveys.

- **Management strategies:** Continue to manage sport fish populations under existing harvest regulations. Conduct creel a survey to collect quantitative data on angler use. Continue to assist the City of Corpus Christi with the water hyacinth control program. Monitor access areas where hydrilla could restrict use. Discuss boat ramp improvements with controlling authorities. Stock Florida Largemouth Bass when water level increases.

INTRODUCTION

This document is a summary of fisheries data collected from Choke Canyon Reservoir in 2013-2014. 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. Management strategies and recommendations are included to address existing problems and/or opportunities. Historical data are presented with the 2013-2014 data for comparison.

Reservoir Description

Choke Canyon is a 25,989-acre reservoir located in the Nueces River Basin on the Frio River. The reservoir was constructed in 1982 and lies approximately 80 miles south of San Antonio. The controlling authority is the City of Corpus Christi. Its main purposes are water supply and recreation. The reservoir has a history of substantial water level fluctuations (Figure 1). During the 2013-2014 sampling season the reservoir averaged 22.5 feet below conservation pool. Shoreline and boat access were adequate with five public boat ramps and substantial area for shoreline angling. Handicap access was limited to the State Park Calliham Unit. Secchi disc measurements of water clarity ranged from 8 to 32 inches. The substrate was composed primarily of silt, clay, sand, and small rock. Littoral habitat consisted of timber stands, periodically flooded terrestrial vegetation, native aquatic vegetation, and seasonally abundant exotic vegetation. Native aquatic vegetation and hydrilla reestablished and became more widespread in the reservoir after refilling in 2002. Water hyacinth became established in 2006 and has been treated with herbicides annually since until 2011. Over the current survey period, substantial losses in vegetative habitat have occurred. Other descriptive characteristics of this reservoir are in Table 1.

Angler Access

Choke Canyon Reservoir has six public boat ramps and no private boat ramps. Three public ramps were unavailable to anglers in 2014 because the end of the boat ramp was above the waterline or needed dredging. Additional boat ramp characteristics are in Table 2. Shoreline access is adequate and available at all boat ramp launch sites as well as extensive shoreline located at Southshore and Calliham units within Choke Canyon State Park. An extended fishing jetty is also available at Calliham state park unit. The Calliham ramp courtesy dock was replaced in 2013.

Management History

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

1. The reservoir continues to be a popular destination for anglers. Collection of quantitative angler data is necessary to evaluate trends in angler effort, catch, and harvest.

   Action: A creel survey was conducted 1 June 2013 through 31 May 2014.

2. Choke Canyon is valued for its high quality Largemouth Bass fishery and for catches of trophy-size fish and stocking Florida Largemouth Bass maintains Florida genetics.

   Action: Florida Largemouth Bass (FLMB) fingerlings were stocked in 2013 at a rate of 16.3/acre.

3. Monitor White Bass population and publicize fishery.

Action: Press releases were distributed to local media. White Bass abundance was monitored annually with gill net surveys. Creel survey was conducted in 2013/2014 to monitor trends in catch statistics.

4. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers. Educate the public about invasive species through the use of media and the internet. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses. Monitor water hyacinth and other exotic nuisance vegetation through vegetation surveys. Revisit the water hyacinth control program and continue to cooperate with the city of Corpus Christi on all vegetation control activities.

   Action: Invasive vegetation was monitored through routine fisheries surveys. Maintained working relationship with the City of Corpus Christi and advised on all vegetation control activities. Vegetation control activities were limited as non-native vegetation abundance declined as water level continued to recede.

Harvest regulation history: Harvest of sport fishes in Choke Canyon Reservoir have always been managed with statewide regulations (Table 3).

Stocking history: Florida Largemouth Bass fingerlings were stocked in the reservoir over a three year period from 2009-2011 (1,184,463) and in 2013 (423,378). This included stockings of ShareLunker Largemouth Bass in 2009 (5,151) and 2010 (2,220). Prior to 2009, the most recent stocking of FLMB occurred in 2003. Northern Largemouth Bass (NLMB) were stocked from 2003 to 2005 as part of a research project examining the potential for increasing NLMB alleles in reservoirs with high FLMB introgression. Blue and Channel Catfish, Striped Bass and White Crappie have been stocked in the past. A complete stocking history can be found in Table 4.

Vegetation/habitat management history: Historically, growth of hydrilla at boat ramps has been controlled with herbicides. However, over the current survey period, hydrilla did not negatively impacted boat and angler access. Isolated colonies of water hyacinth were found on the reservoir from 1998 through 2005. These colonies were initially removed by hand. However, in 2006, water hyacinth expanded and coverage was too great to mechanically remove, thus herbicide treatments were initiated. District staff conducted herbicide treatments on water hyacinth in 2008 (195 acres), 2009 (80 acres), 2010 (525 acres) and 2011 (45 acres). Abundance of nuisance vegetation has decreased substantially and herbicide treatment has not been conducted since 2011.

Water Transfer: Choke Canyon Reservoir is primarily used for municipal/industrial water supply, recreation, and to lesser extent, flood control. Fifty-eight acre-feet of water were released daily to downstream Lake Corpus Christi Reservoir. Intermittent larger releases of water were dependent on water level at Lake Corpus Christi. There was one permanent pumping station on the reservoir transferring water to the municipality of Three Rivers. There are currently no proposals to install additional pumping stations. No inter-basin transfers are known to exist.

METHODS

Fishes were collected by electrofishing (2.0 hours at 24, 5-minute stations), trap netting (15 net nights at 15 stations), and gill netting (14 net nights at 14 stations). Standard electrofishing surveys were conducted at night and sample station selection was random for all gear types (except 2011 trap net survey – biologist selected) as prescribed by the Fishery Assessment Procedures (Texas Parks and Wildlife Department [TPWD], Inland Fisheries Division, unpublished manual revised 2011). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour of actual electrofishing (fish/h) and for gill and trap nets as the number of fish caught in one net set overnight (fish/nn). An aquatic vegetation survey was not conducted in 2013. Mean age at length was calculated for Largemouth Bass between 13 – 15 inches total length from 2008 through 2013. All fish collected for age and growth analysis were aged using otoliths(TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Alligator Gar were collected with multifilament gill nets (biologist selected sites, variable effort) ranging in size from 3.0-6.0 inch bar mesh in early spring and summer from 2011 through 2013. Size structure data were adjusted for gear selectivity. Adult Alligator Gar abundance was estimated using the POPAN formulation (Schwarz and Arnason 1996) of the Jolly-Seber model in Program MARK (Cooch and White 2014). Voluntary angler tag return data was used to calculate annual exploitation rates by dividing the number of tags returned by the total number of tagged fish at large. Annual estimates were adjusted to account for tag loss (Buckmeier and Reeves 2012) and observed handling mortality (< 3% annually). Because tag reporting rates were unknown, we estimated exploitation over a range of possible tag reporting rates consistent with the literature (i.e. 20 to 80%; Miranda et al 2002, Meyer et al. 2012).

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Micro-satellite analysis was used to determine genotype of individual fish from 2005 through 2013 and by electrophoresis for previous years.

Creel survey sampling was designed with unequal probabilities for boat ramp and time period selection on a quarterly basis (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Creel quarters were defined as: summer = June 1 through August 31; fall = September 1 through November 30; winter = December 1 through February 28; and spring = March 1 through May 31. Nine surveys were conducted per quarter (5 weekend days and 4 week days), totaling 36 creels per year. Additional information was obtained from interviewed anglers including Largemouth Bass angler type and the weights of Largemouth Bass that were caught and released.

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Size Distribution (PSD) for various length categories, terminology modified by Guy et el. (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 according to DiCenzo et al. (1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all catch statistics and standard error (SE) was calculated for structural indices and IOV. Source for water level data was the Nueces River Authority (NRA) website (http://www.nueces-ra.org/CP/CITY/day.php).

RESULTS AND DISCUSSION

Habitat: In 2011, total native vegetation coverage was 300 acres (1.4%), a substantial decrease from 2,423 acres (9.3%) in 2007. Water stargrass and coontail were the most abundant native vegetation species in 2011. Total non-native vegetation coverage was 656 acres (3.1%) in 2011, substantially lower than the 4,127 acres (15.9%) in 2007. Hydrilla and water hyacinth were the only two exotic plants species observed during the 2011 vegetation survey and were present in 616 acres (2.9%) and 39.9 acres (< 1.0%) of water, respectively (Table 6). Although no habitat surveys have been conducted since 2011, substantial losses in vegetative habitat were observed to occur over the survey period attributed to decreased water level.

Creel: Directed fishing effort by anglers in 2013-2014 was highest for all catfish species (39.4%), followed by Largemouth Bass (27.6; combined tournament [3.7%] and non-tournament [23.9%] anglers), Blue Catfish (11.0%), no species preference (10.6%), White Bass (5.3%), and White Crappie (5.0%); (Table 7). Notable trends in directed fishing effort in 2013-2014 included decreased effort for Largemouth Bass and increased directed effort for all catfish species, Blue Catfish, no species preference, White Bass, and White Crappie (Tab 7). Total fishing effort for all species was 137,258 h and anglers spent an estimated $1,127,986 on direct expenditures in 2013-2014 (Table 8). Total fishing effort and direct expenditures were substantially reduced in 2013-2014 compared to previous years (Table 8).

Prey Species: Gizzard Shad abundance increased over the survey period. Catches were similar in 2012 (131.0/h) and 2013 (115.0/h), higher than in 2011 (59.5/h; Figure 2). Population size structure of Gizzard Shad was consistent among years (IOV range: 84 – 89); indicating the majority of individuals collected were of suitable size as forage to predator fishes. Threadfin Shad CPUE in 2013 was 126.5/h, further contributing to the shad forage base (Appendix A). Bluegill were present in moderate abundance in 2013, however, Bluegill catches have trended down since 2010 which may be attributed to declining water level and associated habitat loss. The electrofishing catch rate of Bluegill in 2013 was 66.0/h, lower than values in 2011 (95.5/h), yet slightly higher than 2012 (51.0/h) (Figure 3). The majority of Bluegill collected were < 6 in total length and thus should provide excellent forage to predator species. Abundance of Redear Sunfish was low (Figure 4). Sampling indicated several large sunfish were present. Survey results indicated ample prey base for sport fish and that availability of prey should not be a limiting factor to the growth and condition of sport fish in the reservoir.

Alligator Gar: A total of 669 Alligator Gar were collected from 2011-2013 and total length ranged from 38 to 88 inches (Figure 5). Adult population abundance was estimated at 5,437 (95% CI = 3,215 – 9,195) individuals. Annual exploitation of adult Alligator Gar was low and varied among years (0 to 2.3%; Figure 6). Alligator Gar in the reservoir represented a robust population and could provide anglers with high quality angling opportunities in terms of number and size of fish.

Blue Catfish: Blue Catfish abundance remained high over the study period (CPUE range: 30.7 – 32.6/nn; Figure 7). Proportional size distribution was low, consistent across years, and indicated a Blue Catfish population comprised primarily of smaller individuals. Roughly 37% of the fish sampled were ≥ 12 in total length and available to angler harvest. Few (N = 8) quality-sized (≥ 20 in) individuals were collected; CPUE-20 declined over the survey period (Figure 7). Condition of fish greater than 12-in total length remained consistent across years for most size classes and increased with length (Figure 7).

Blue Catfish directed effort in 2013/2014 was substantially less than directed effort in 2009/2010 but similar to angling effort in 2010/2011 (Table 9). Angler catch rate (#/h) was consistent among years (range: 0.92 – 1.14/h). Total harvest was substantially reduced in 2010/2011 (38,366) and 2013/2014 (40,637) relative to 2009/2010 (115,596). Angler compliance was excellent and harvested fish ranged in length between 12 – 44 inches and the majority of harvest occurred between 12 – 18 inches, all years combined (Figure 8).

Channel Catfish: Relative abundance of Channel Catfish decreased over the survey period. Gill net CPUE in 2014 was 0.9/nn, compared to 2.7/nn and 2.6/nn in 2012 and 2013, respectively (Figure 9). The sample was dominated by smaller individuals and only one fish in the 2014 catch was legal size (≥ 12 in).

Channel Catfish directed effort in 2013/2014 increased slightly compared to previous years (Table 10). Anglers spent 629 h targeting Channel Catfish and harvest was estimated at 5,657 fish in 2013/2014. Fish 12 – 16 inches comprised the majority of harvest (Figure 10).

White Bass: White Bass abundance declined substantially over the survey period. White Bass catch rates were 0.4/nn in 2013 and 2014, considerably lower than in 2012 (7.2/nn) (Figure 11). Body condition was poor evidenced by W_r values below 80. All fish collected in 2014 were > the 10-in length limit and available for angler harvest.

Angling effort for White Bass increased over the survey period (Table 11). Angler success also increased, evidenced by increased angler catch rate and total harvest in 2013/2014 compared to previous years. Harvested fish ranged between 10 – 15 inches total length (Figure 12).

Largemouth Bass: Relative abundance of Largemouth Bass was significantly reduced over the survey period. The electrofishing catch rate of Largemouth Bass was 65.5/h in 2013, lower than 90.0/h in 2012 and considerably reduced from 330.5/h in 2011 (Figure 13). Catch of legal-size and larger fish also declined. Population size structure was balanced (PSD = 65) in 2013. In 2013, relative weights of Largemouth Bass were low (W_r ≤ 85) for smaller size classes (i.e., ≤ 14-in) and tended to increase with length (Figure 13). Mean age at legal length in 2013 was 2.8 years. Growth was considered adequate but has slowed since 2008 (Table 12). Introgression of FLMB genetics in the population has remained high over the past decade (%FLMB allele; mean = 82 [2.8], range: 78 – 89, n = 11 years). In 2013, 17% of the sample had the Florida Largemouth Bass genotype (Table 13). The considerable decline in abundance of Largemouth Bass over the study period likely can be attributed to significant decline in water level and the concomitant decline in fisheries habitat (i.e., vegetation).

Largemouth Bass were the second most sought species and continued to be a popular sport fish in the reservoir; however, directed effort dropped considerably in 2013/2014 (Table 14). Largemouth Bass angling effort comprised 27.6% of total directed effort in 2013/2014 representing a 59% drop in directed effort when compared to 2009/2010. Tournament activity on the reservoir also dropped considerably. Tournament anglers spent only 5,090 h fishing for Largemouth Bass compared to 60,878 h in 2009/2010; representing a 92% decline in tournament effort (Table 14). Angler catch rate remained similar across years (range: 0.49 – 0.69/h). The majority of legal Largemouth Bass caught were released, ranging from 66 – 74 percent (Table 14). Harvest also decreased over the survey period. Angler compliance was excellent and harvested fish ranged from 14 – 26 inches total length and the majority of observed harvest occurred in the 14 – 18 in size range, all years combined (Figure 14). Over the creel survey periods, 339 Largemouth Bass weighing >10 lbs and 957 fish weighing between 7 and 10 lbs were caught and released by anglers.

White Crappie: The trap net catch rate of White Crappie was 2.7/nn in 2013, similar to values in 2009 (1.8/nn) and 2011 (2.1/nn) (Figure 15). Size structure of White Crappie in 2013 indicated a balanced size composition, but the population was limited in terms of overall abundance. Body condition in 2013 was sufficient (W_r > 90 for all size classes Figure 15).

Directed effort and harvest increased over the study period (Table 15). Angler catch rate in 2013/2014 was 0.80/h, higher than values in previous years. Angler compliance was excellent and harvested fish ranged in length between 10 – 15 inches, all years combined (Figure 16).

Fisheries management plan for Choke Canyon Reservoir, Texas.

Prepared – July 2014 *(revised Jan 2015)*

Issue 1: The reservoir continues to be a popular destination for anglers. Collection of quantitative data such as angler effort, catch, and harvest is necessary to evaluate trends in fishery statistics.

MANAGEMENT STRATEGIES

1. Conduct an access point creel survey spanning 1 June 2015 through 31 May 2016 and 1 June 2017 through 31 May 2018
2. Maintain and continue to collect data for Largemouth Bass trophy database.

Issue 2: Choke Canyon is valued for its high quality Largemouth Bass fishery and for catches of trophy-size fish. From 2009 – 2014, 339 Largemouth Bass weighing >10 lbs and 957 fish weighing between 7 and 10 lbs were caught and released by anglers. The reservoir has produced a total of 13 ShareLunkers. Further, the lake record was broken in 2009 and currently stands at 15.45 pounds.

MANAGEMENT STRATEGIES

1. When water level increases, request FLMB fingerlings for stocking to maintain a high level Florida Bass introgression and thus maximize production of trophy fish.

Issue 3: Choke Canyon Reservoir supports a robust and healthy population of Alligator Gar in terms of number and size of fish. The reservoir exhibited potential for management of an Alligator Gar trophy fishery. Several trophy-size Alligator Gar were collected over the study period and available for angler harvest.

MANAGEMENT STRATEGIES

1. Maintain the 1/fish daily bag to further promote and enhance the trophy characteristics of the Alligator Gar population at the reservoir.
2. Promote the Alligator Gar fishery and Alligator Gar angling opportunities by disseminating press releases to local and statewide media.

Issue 4: Choke Canyon Reservoir has multiple boat ramps that are unusable during periods of low water level.

MANAGEMENT STRATEGIES

1. Meet with City of Corpus Christi and TPWD Choke Canyon State Park administrators to discuss the potential of ramp improvement projects and provide information about the Boating Access Grant program.

Issue 5: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, 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. Exotic plants such as water hyacinth and hydrilla have historically been a severe problem, primarily in the upper end and tributaries of the reservoir. These exotic plants restrict recreational use and can impact the quality of fish and wildlife habitat restricting growth and colonization of native vegetation.

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.
6. Monitor water hyacinth and other exotic nuisance vegetation through vegetation surveys as needed.
7. Re-evaluate the water hyacinth control program and continue to cooperate with the City of Corpus Christi on all vegetation control activities.

SAMPLING SCHEDULE JUSTIFICATION

The proposed sampling schedule includes annual electrofishing and gill netting, additional trap netting in 2017 and mandatory monitoring in 2015/2016 (Table 16). Additional electrofishing and gill netting is necessary to maintain consistent trend data on heavily utilized Largemouth Bass and catfish populations. A creel survey will be conducted in 2015/2016 and 2017/2018 to monitor catch and harvest of important sport fish species. A Federal Aid report will be prepared in 2016.

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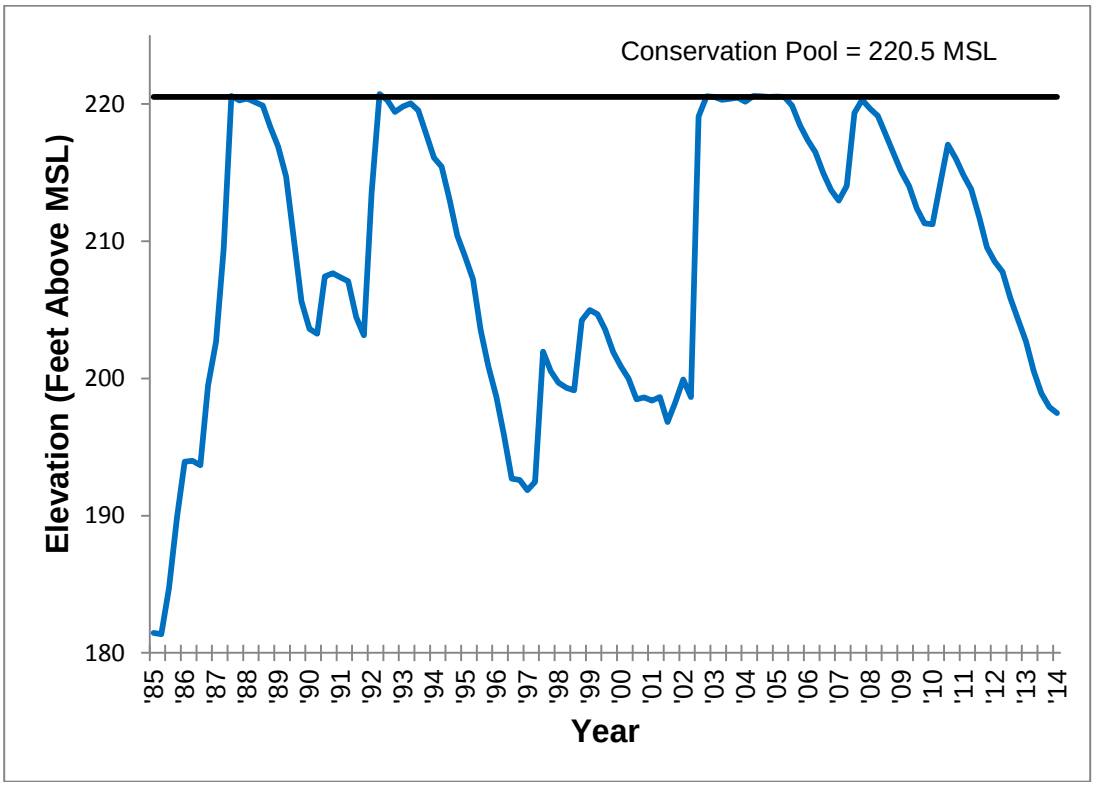

Figure 1. Mean quarterly water elevations in feet above mean sea level (MSL) recorded for Choke Canyon Reservoir, Texas, 1985 through Jan 2014.

Table 1. Characteristics of Choke Canyon Reservoir, Texas.

Characteristic	Description
Year constructed	1982
Controlling authority	City of Corpus Christi, Nueces River Authority, U.S. Bureau of Reclamation, TPWD (surrounding lands)
Counties	Live Oak, McMullen
Reservoir type	Mainstem
Shoreline Development Index	7.1
Conductivity (umhos/cm)	600
Access: Boat	Good – 6 public ramps
Bank	Adequate – 6 public ramp areas, 1 fishing jetty, Wildlife Management Area access, State Park shoreline access
Physically challenged	Adequate – Calliham State Park – concrete jetty Inadequate – South Shores State Park

Table 2. Boat ramp characteristics for Choke Canyon Reservoir, Texas, August, 2013. Reservoir elevation at time of survey was 196.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Southshore Unit	28.47328° -98.25134°	Y	72	194.0	Unusable. Dredging needed
Calliham Unit	28.48221° -98.35354°	Y	128	190.0	Excellent, no access issues
Mason Point	28.48047° -98.37375°	Y	28	198.0	Out of water. Extension is feasible
FM 99 Bridge	28.52331° -98.38835°	Y	20	192.0	Excellent, no access issues
Daughtery WMA	28.50895° -98.44010°	Y	15	UNK	Out of water. Extension not feasible
Bracken	28.47658° -98.50475°	Y	16	UNK	Out of water. Extension not feasible

Table 3. Harvest regulations for Choke Canyon Reservoir, Texas.

Species	Bag Limit	Length Limit
Gar, Alligator	1	none
Catfish: Channel and Blue, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history at Choke Canyon Reservoir, Texas. Size categories are: FRY = fry, FGL = fingerling and ADL = adults.

Species	Year	Number	Size
Threadfin Shad	1981	10,000	ADL
	1982	4,000	ADL
	1983	8,000	ADL
	Total	22,000	
Fathead Minnow	1981	Unknown	ADL
	Total	Unknown	
Blue Catfish	1982	98,800	FGL
	1983	102,088	FGL
	Total	200,088	
Channel Catfish	1981	92,200	FGL
	1982	307,000	FGL
	1983	91,256	FGL
	Total	490,456	
Coppernose Bluegill	1981	2,500	UNK
	1982	659,034	UNK
	1983	112,000	UNK
	Total		
Striped Bass	1983	102,600	FGL
	Total	102,600	
Northern Largemouth Bass	2003	107,137	FGL
	2004	99,632	FGL
	2005	102,314	FGL
	Total	309,083	
Florida Largemouth Bass	1981	19,906	FGL
	1982	146,030	FGL
	1983	143,368	FGL
	1990	375,790	FRY
	1998	383,565	FGL
	2002	384,236	FGL
	2003	180,014	FGL
	2009	5,151	FGL
	2010	526,015	FGL
	2011	653,297	FGL
	2013	423,378	FGL
	Total	2,817,372	
White Crappie	1992	148,294	FRY
	1993	33,380	FGL
	Total	181,674	

Table 5. Survey of structural habitat types, Choke Canyon Reservoir, Texas, 2005. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Concrete	2.6 miles	1.4
Eroded Bank	30.5 miles	16.9
Natural	142.2 miles	80.2
Rip-rap	1.3 miles	0.7
Rocky/gravel	1.5 miles	0.8
Standing timber	2,563.0 acres	9.9

Table 6. Survey of aquatic vegetation, Choke Canyon Reservoir, Texas, 2007 and 2011. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2007	2011
Native submersed	2,423 (9.3)	300 (1.4)
Native floating-leaved		
Native emergent		
Non-native	4,127 (15.9)	656 (3.1)
Hydrilla (Tier III)	3,788 (14.6)	616 (2.9)
Water hyacinth (Tier III)	1,541 (5.9)	40 (0.1)

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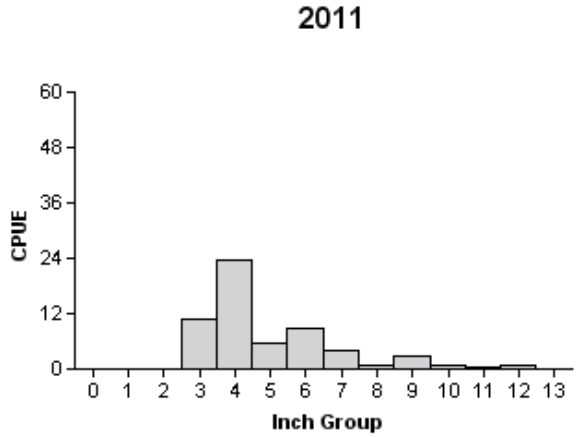
Table 7. Percent directed angling effort by species at Choke Canyon Reservoir, Texas, 2009 – 2011 and 2013/2014. Survey periods were from 1 June through 31 May.

	Year		
Species	2009/2010	2010/2011	2013/2014
Alligator Gar	<1.0	0.0	<1.0
All catfish species	24.3	32.7	39.4
Blue Catfish	4.7	2.7	11.0
Channel Catfish	<1.0	<1.0	<1.0
Flathead Catfish	<1.0	<1.0	0.0
White Bass	<1.0	1.0	5.3
Largemouth Bass	66.7	59.8	27.6
White Crappie	<1.0	<1.0	5.0
Anything	2.1	2.8	10.6

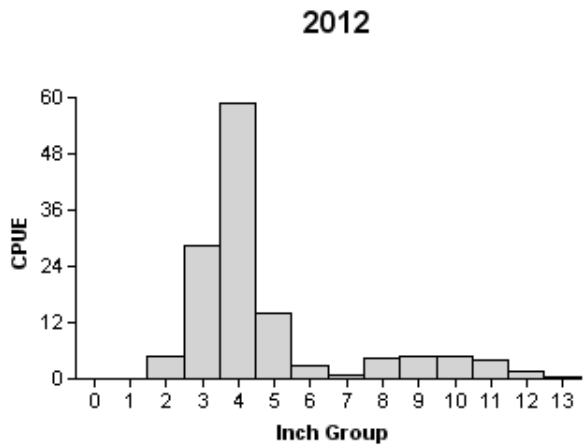
Table 8. Total angling effort (h) for all species and total directed expenditures for Choke Canyon Reservoir, Texas, 2009 – 2011 and 2013/2014. Survey periods were from 1 June through 31 May. Relative standard error is in parentheses.

	Year		
Creel Statistic	2009/2010	2010/2011	2013/2014
Total fishing effort	305,201	222,710	137,258
Total directed expenditures	$4,052,758	$2,601,509	$1,127,986

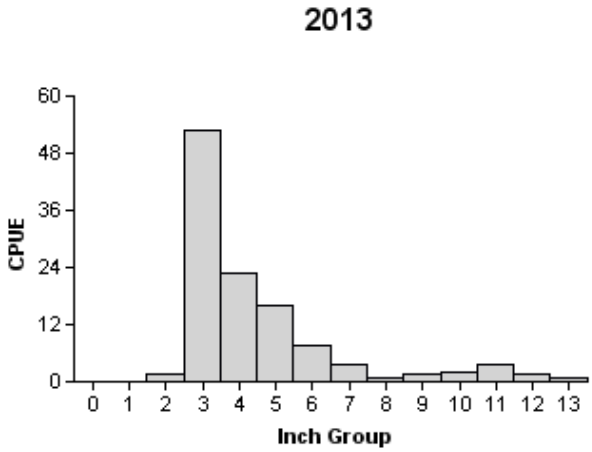
Gizzard Shad



Effort = 2.0
Total CPUE = 59.5 (36; 119)
IOV = 89 (6)



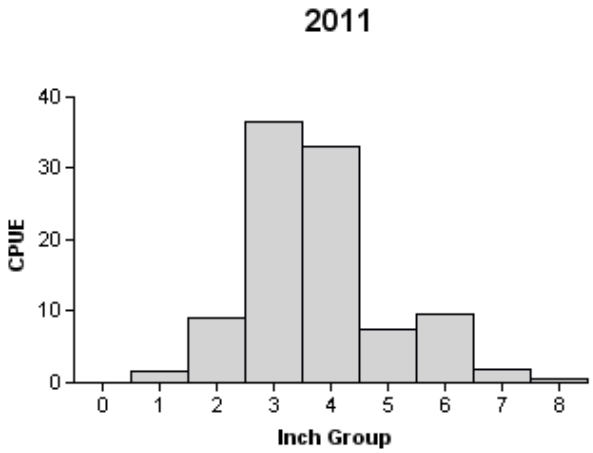
Effort = 2.0
Total CPUE = 131.0 (27; 262)
IOV = 84 (5)



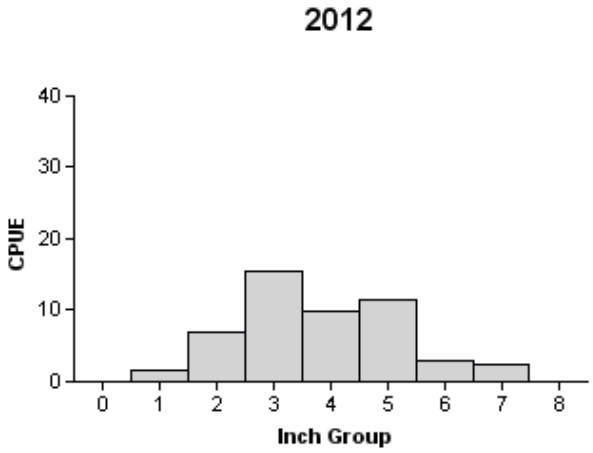
Effort = 2.0
Total CPUE = 115.0 (22; 230)
IOV = 87 (3)

Figure 2. Comparison of the 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, Choke Canyon Reservoir, Texas, 2011, 2012, and 2013.

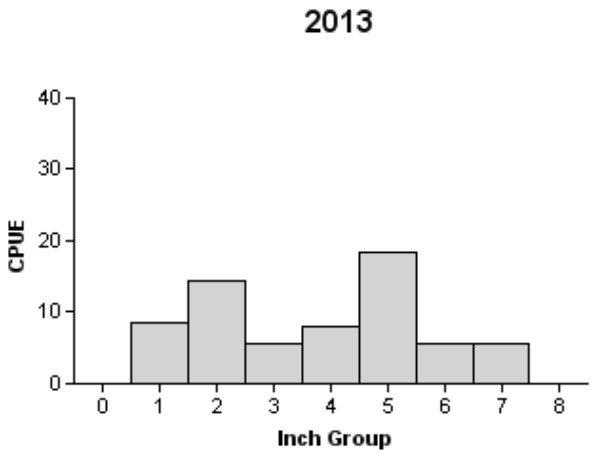
Bluegill



Effort =	2.0
Total CPUE =	99.5 (22; 199)
Stock CPUE =	89.0 (23; 178)
CPUE-6 =	12.0 (35; 24)
PSD =	13 (5)



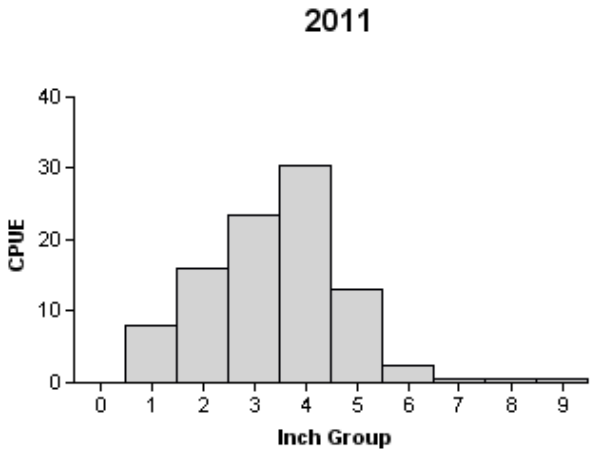
Effort =	2.0
Total CPUE =	51.0 (24; 102)
Stock CPUE =	42.5 (22; 85)
CPUE-6 =	5.5 (41; 11)
PSD =	13 (5)



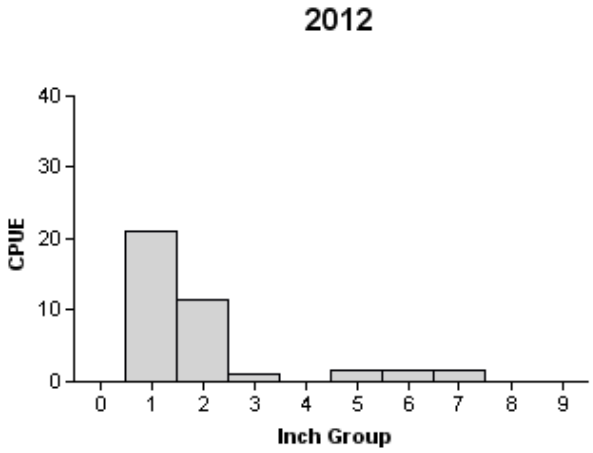
Effort =	2.0
Total CPUE =	66.0 (21; 132)
Stock CPUE =	43.0 (26; 86)
CPUE-6 =	11.0 (32; 22)
PSD =	26 (4)

Figure 3. Comparison of the 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, Choke Canyon Reservoir, Texas, 2011, 2012, and 2013.

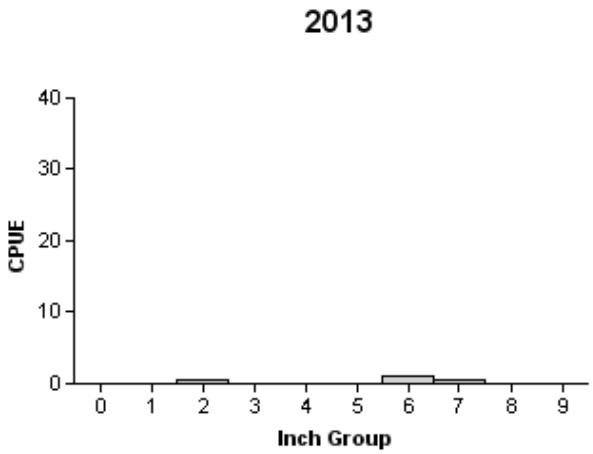
Redear Sunfish



Effort =	2.0
Total CPUE =	95.0 (17; 190)
Stock CPUE =	47.5 (19; 95)
CPUE-6 =	4.0 (43; 8)
PSD =	3 (2)



Effort =	2.0
Total CPUE =	38.0 (47; 76)
Stock CPUE =	4.5 (42; 9)
CPUE-6 =	3.0 (43; 6)
PSD =	33 (14)



Effort =	2.0
Total CPUE =	2.0 (59; 4)
Stock CPUE =	1.5 (73; 3)
CPUE-6 =	1.5 (73; 3)
PSD =	33 (16)

Figure 4. Comparison of the number of Redear Sunfish 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, Choke Canyon Reservoir, Texas, 2011, 2012, and 2013.

Alligator Gar

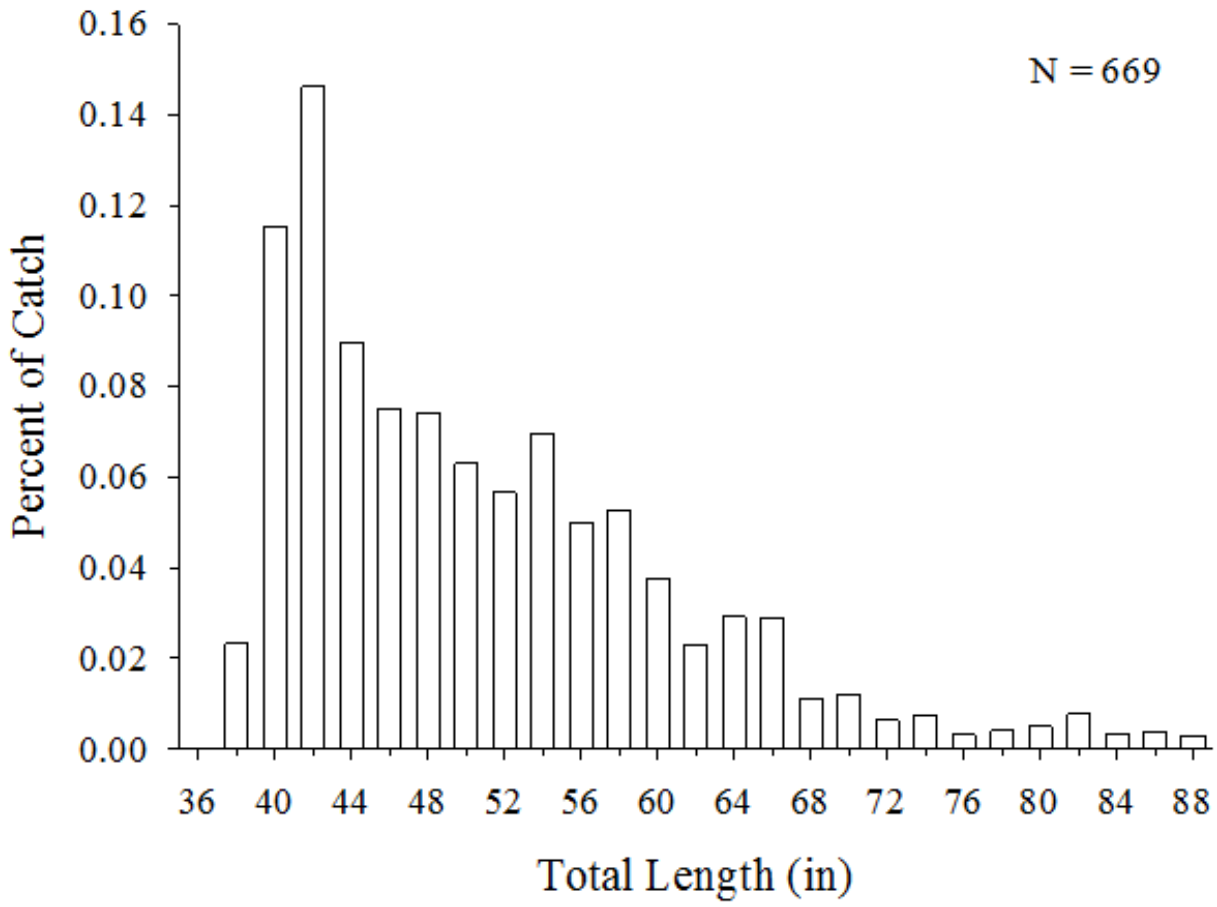


Figure 5. Total length distribution of Alligator Gar, Choke Canyon Reservoir, Texas, 2011 – 2013, adjusted for gear selectivity.

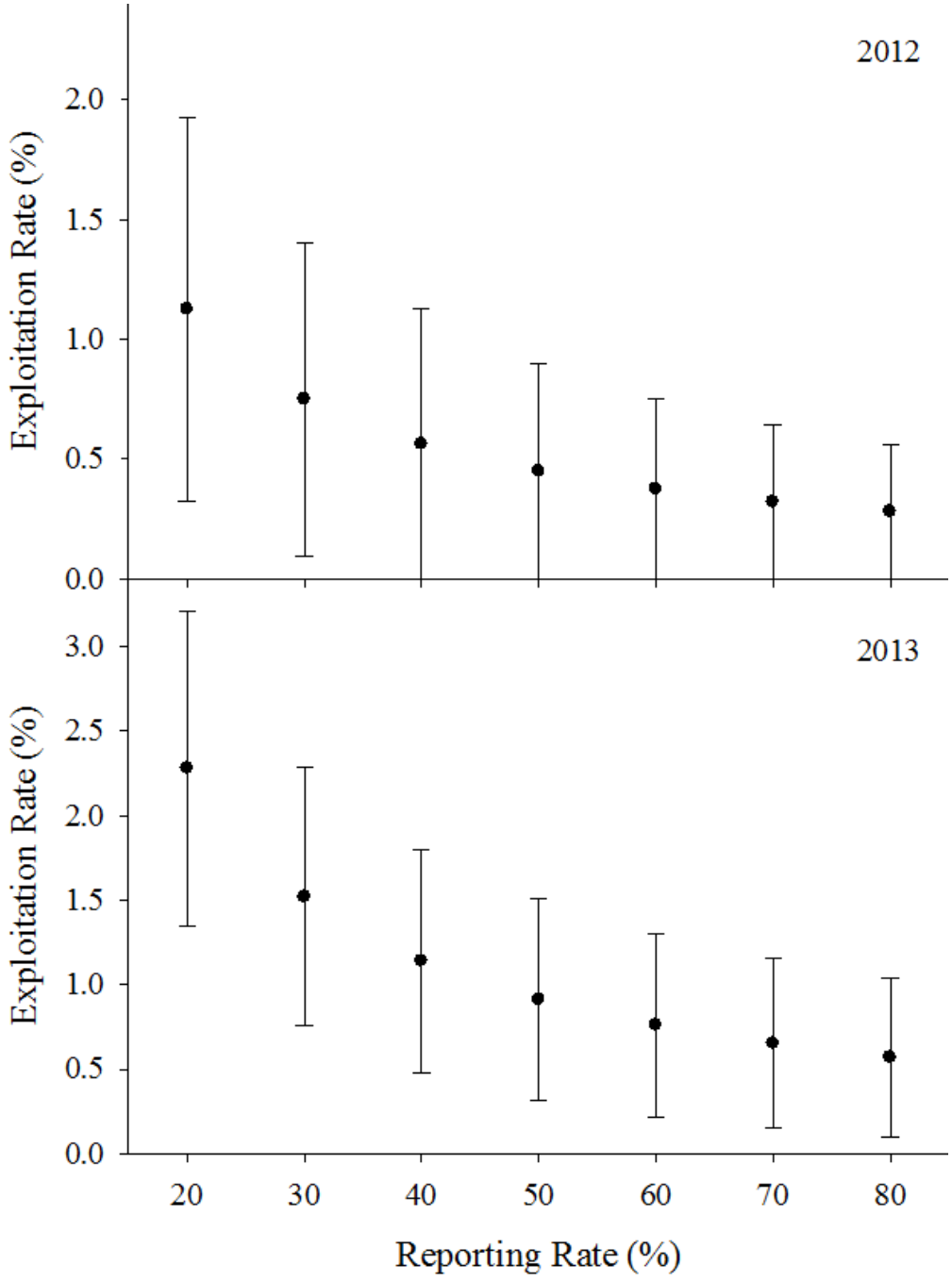


Figure 6. Annual exploitation estimates of Alligator Gar, Choke Canyon Reservoir, Texas, during 2012 and 2013. Error bars represent 95% confidence limits.

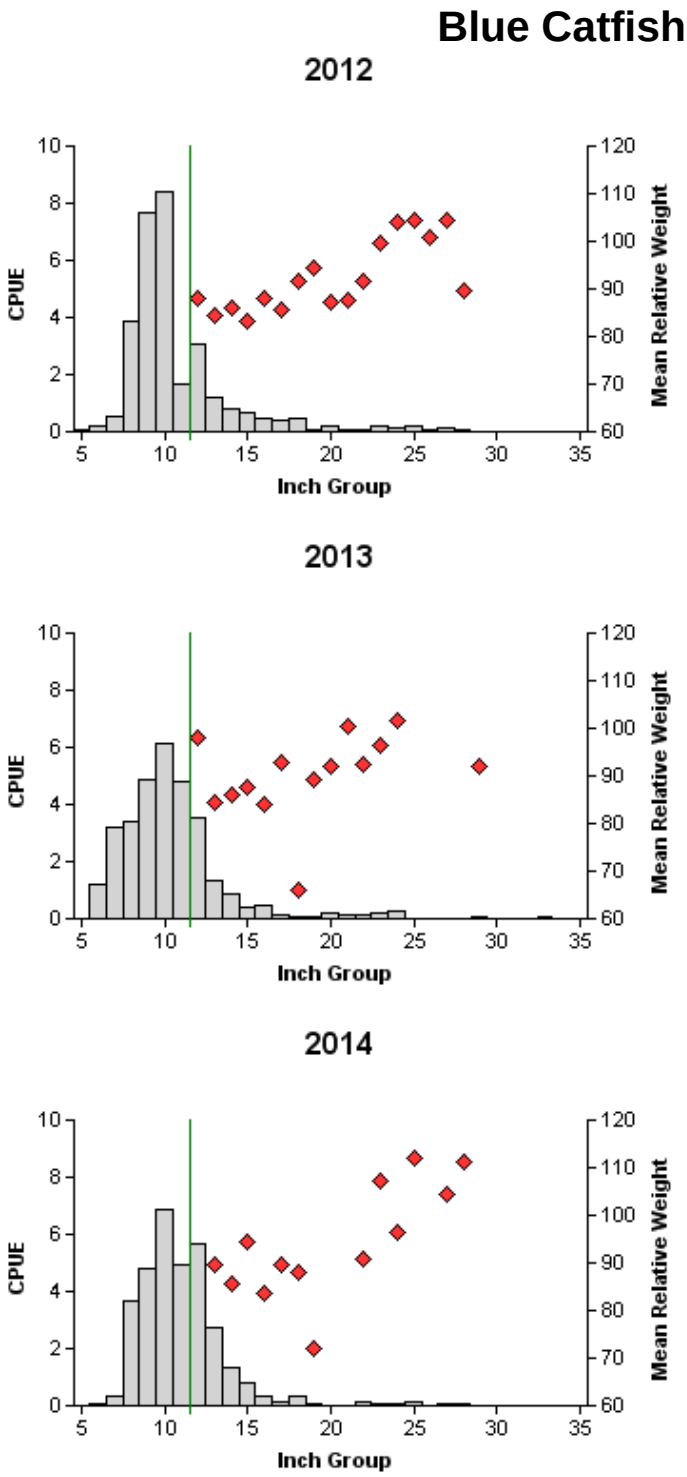


Figure 7. Comparison of the number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Choke Canyon Reservoir, Texas, 2012, 2013, and 2014. Vertical line denotes 12-inch minimum length limit.

Blue Catfish

Table 9. Creel survey statistics for Blue Catfish at Choke Canyon Reservoir from June 2009 through May 2011 and June 2013 through May 2014. Total catch per hour represents anglers targeting Blue Catfish and total harvest is estimated number of Blue Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year		
Creel Survey Statistic	2009/2010	2010/2011	2013/2014
Directed effort (h)	14,417 (20)	6,118 (29)	15,132 (27)
Directed effort/acre	0.68 (20)	0.26 (29)	1.05 (27)
Average angler catch rate (#/h)	1.12 (44)	1.14 (51)	0.92 (40)
Total harvest	115,596 (26)	38,366 (25)	40,637 (43)
Harvest/acre	5.43 (26)	1.65 (25)	2.82 (43)

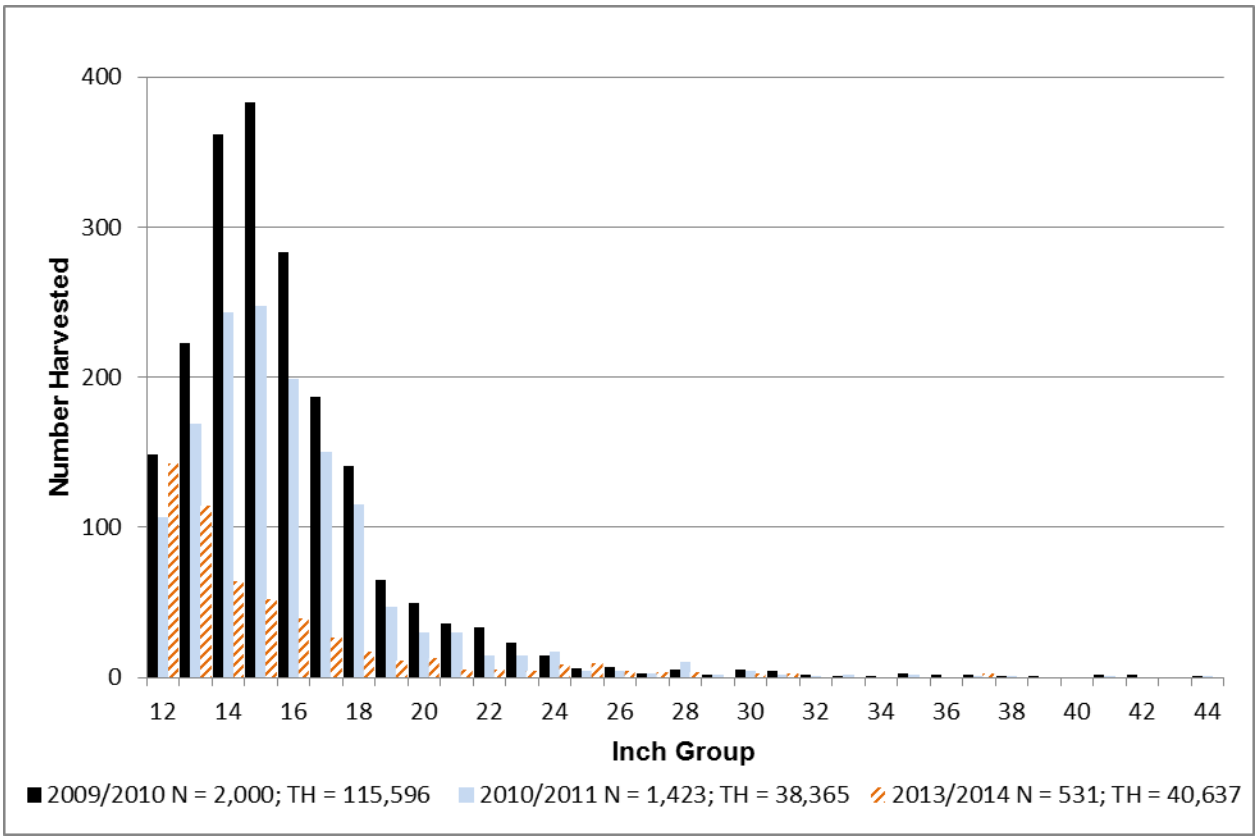


Figure 8. Length frequency of harvested Blue Catfish observed during creel surveys at Choke Canyon Reservoir, Texas, June 2009 through May 2011 and June 2013 through May 2014, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys and TH is the total estimated harvest for the creel period.

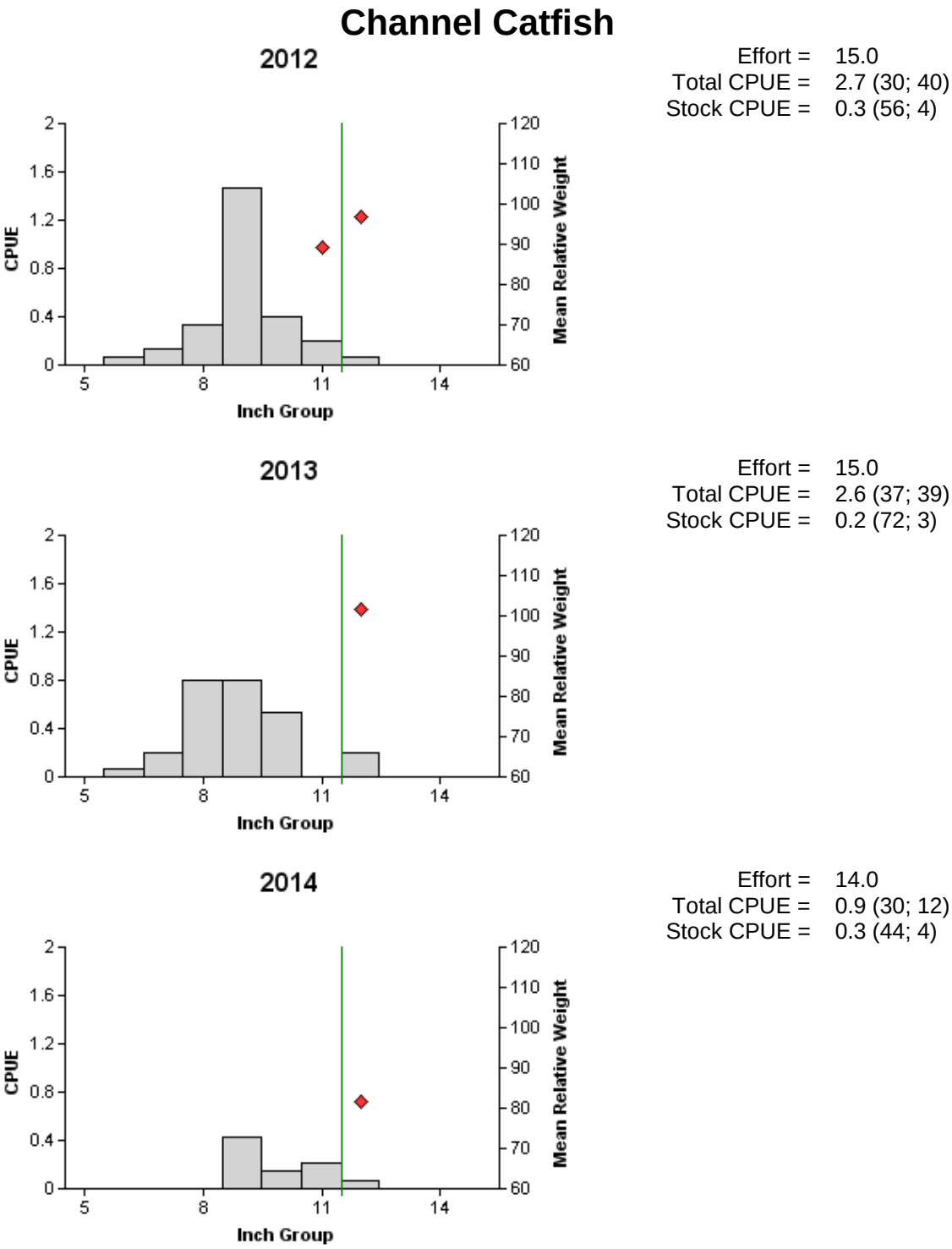


Figure 9. Comparison of the number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Choke Canyon Reservoir, Texas, 2012, 2013, and 2014. Vertical line denotes 12-inch minimum length limit.

Channel Catfish

Table 10. Creel survey statistics for Channel Catfish at Choke Canyon Reservoir from June 2009 through May 2011 and June 2013 through May 2014. Total catch per hour represents anglers targeting Channel Catfish and total harvest is estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year		
Creel Survey Statistic	2009/2010	2010/2011	2013/2014
Directed effort (h)	292 (97)	188 (116)	629 (75)
Directed effort/acre	0.01 (97)	0.01 (116)	0.04 (75)
Average angler catch rate (#/h)	8.00 (***)	0.22 (50)	0.00 (***)
Total harvest	11,475 (40)	2,862 (44)	5,657 (60)
Harvest/acre	0.54 (40)	0.12 (44)	0.39 (60)

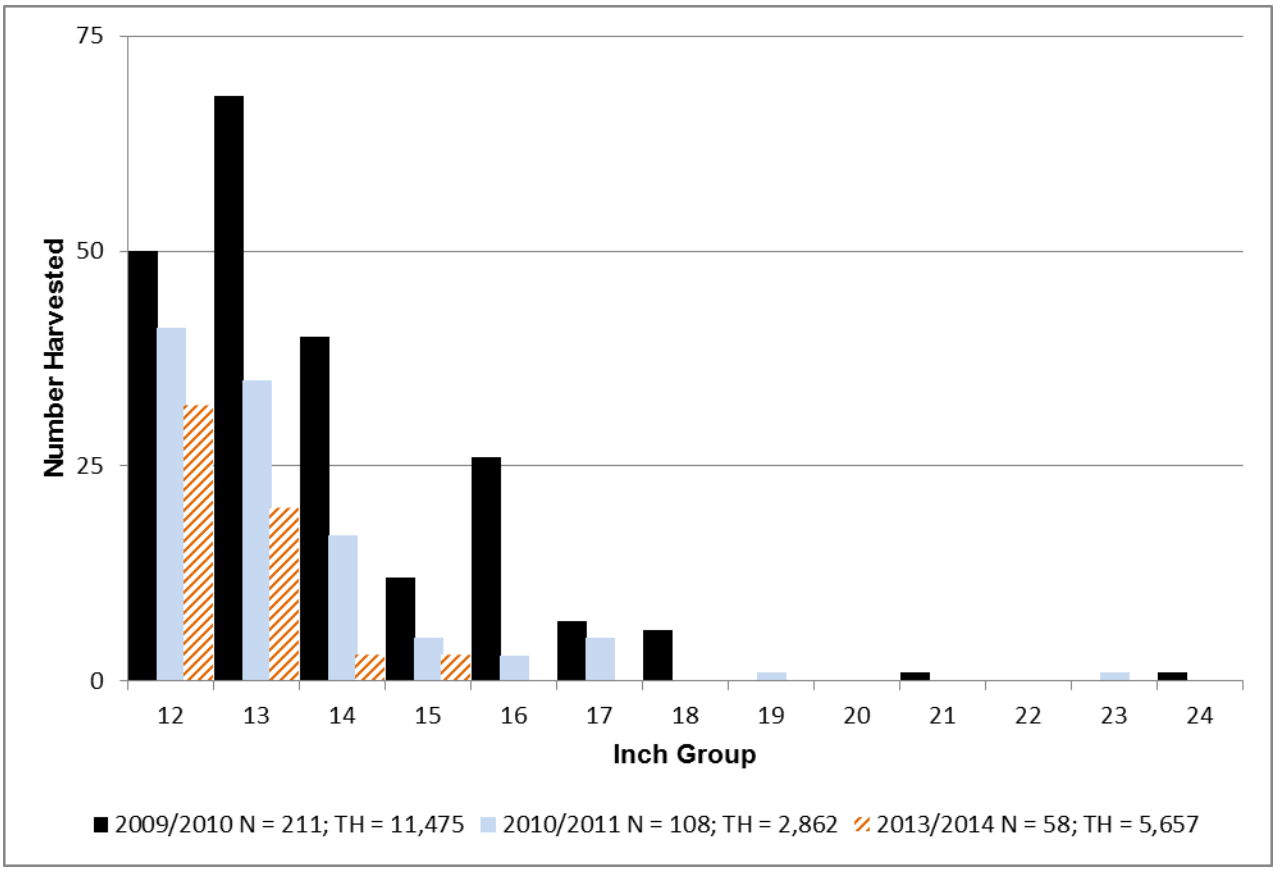


Figure 10. Length frequency of harvested Channel Catfish observed during creel surveys at Choke Canyon Reservoir, Texas, June 2009 through May 2011 and June 2013 through May 2014, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys and TH is the total estimated harvest for the creel period.

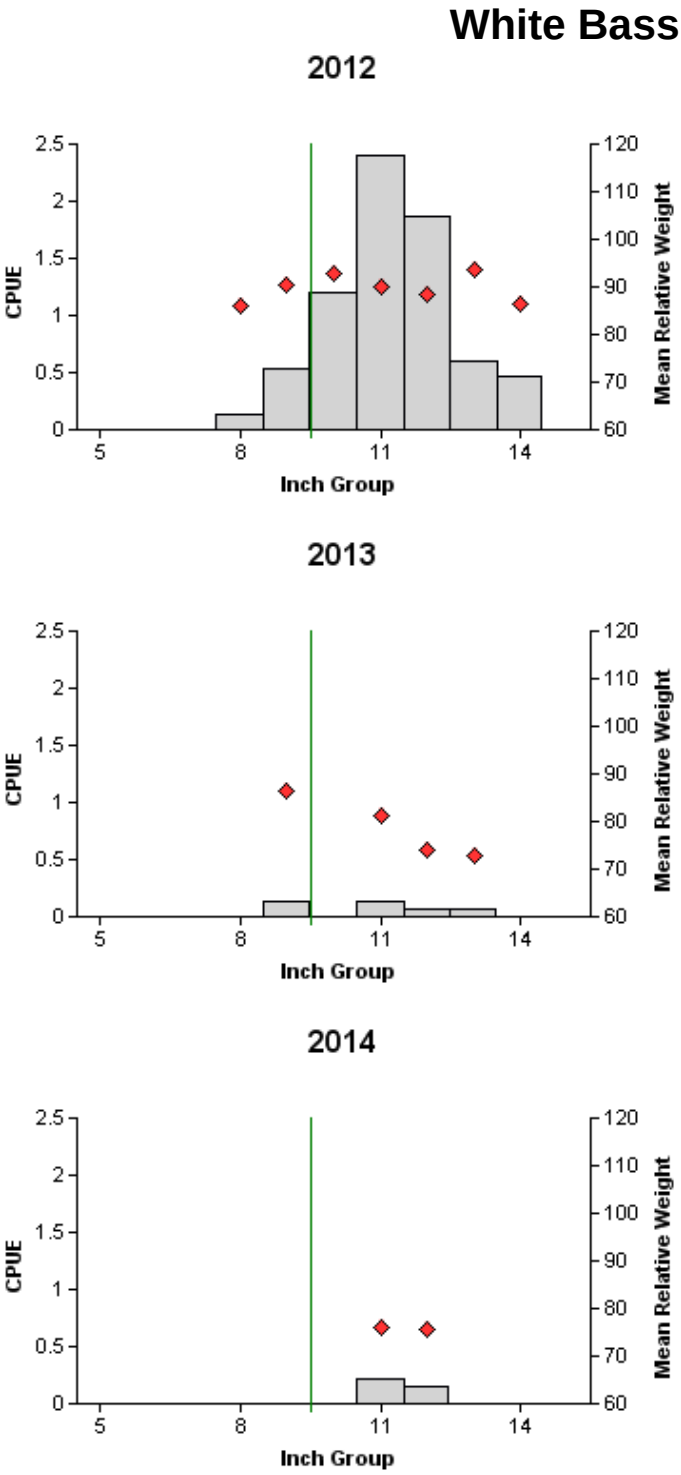


Figure 11. Comparison of the number of White Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Choke Canyon Reservoir, Texas, 2012, 2013, and 2014. Vertical line denotes 10-inch minimum length limit.

White Bass

Table 11. Creel survey statistics for White Bass at Choke Canyon Reservoir from June 2009 through May 2011 and June 2013 through May 2014. Total catch per hour represents anglers targeting White Bass and total harvest is estimated number of White Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year		
Creel Survey Statistic	2009/2010	2010/2011	2013/2014
Directed effort (h)	1,372 (54)	2,128 (49)	7,215 (30)
Directed effort/acre	0.06 (54)	0.09 (49)	0.50 (30)
Average angler catch rate (#/h)	0.13 (15)	0.06 (43)	1.47 (58)
Total harvest	-	755 (189)	17,010 (42)
Harvest/acre	-	0.03 (189)	1.18 (42)

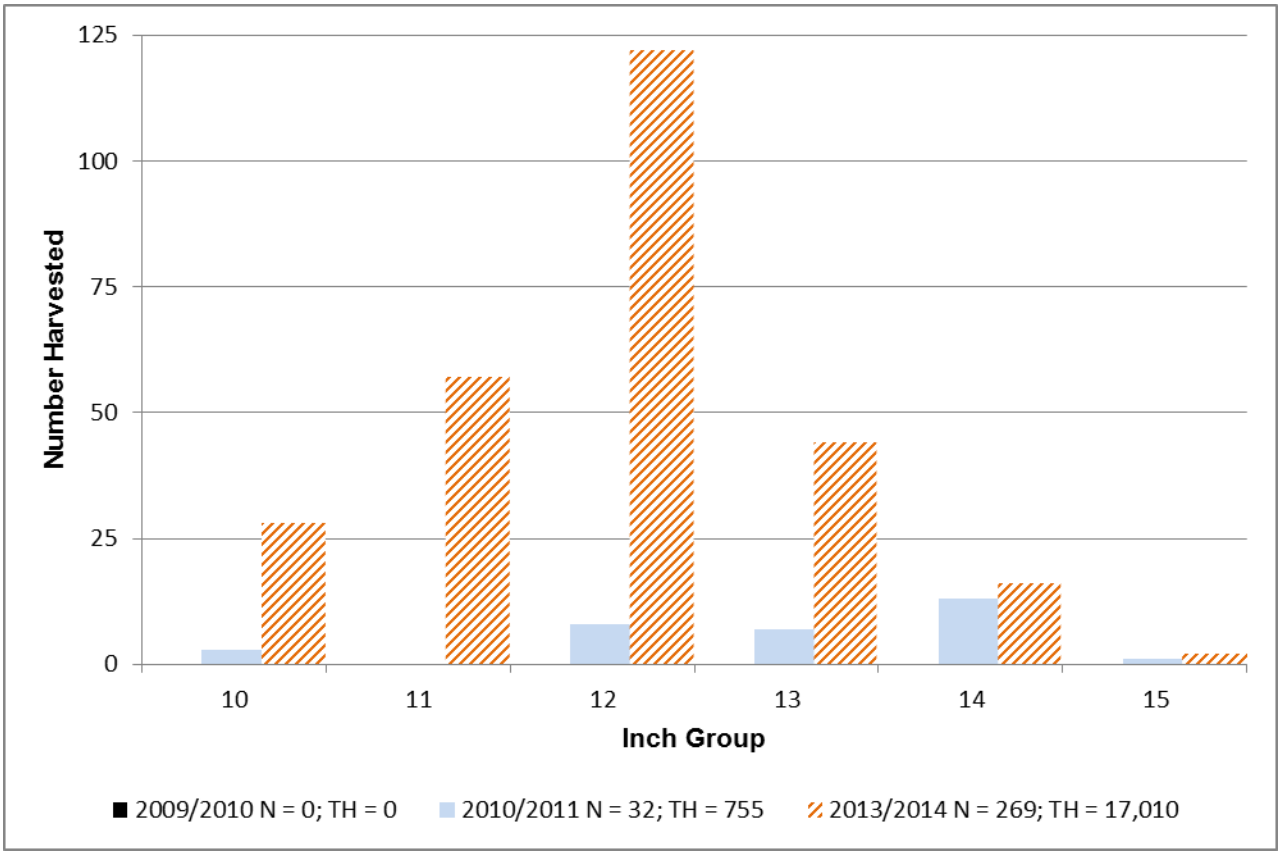


Figure 12. Length frequency of harvested White Bass observed during creel surveys at Choke Canyon Reservoir, Texas, June 2009 through May 2011 and June 2013 through May 2014, all anglers combined. N is the number of harvested White Bass observed during creel surveys and TH is the total estimated harvest for the creel period.

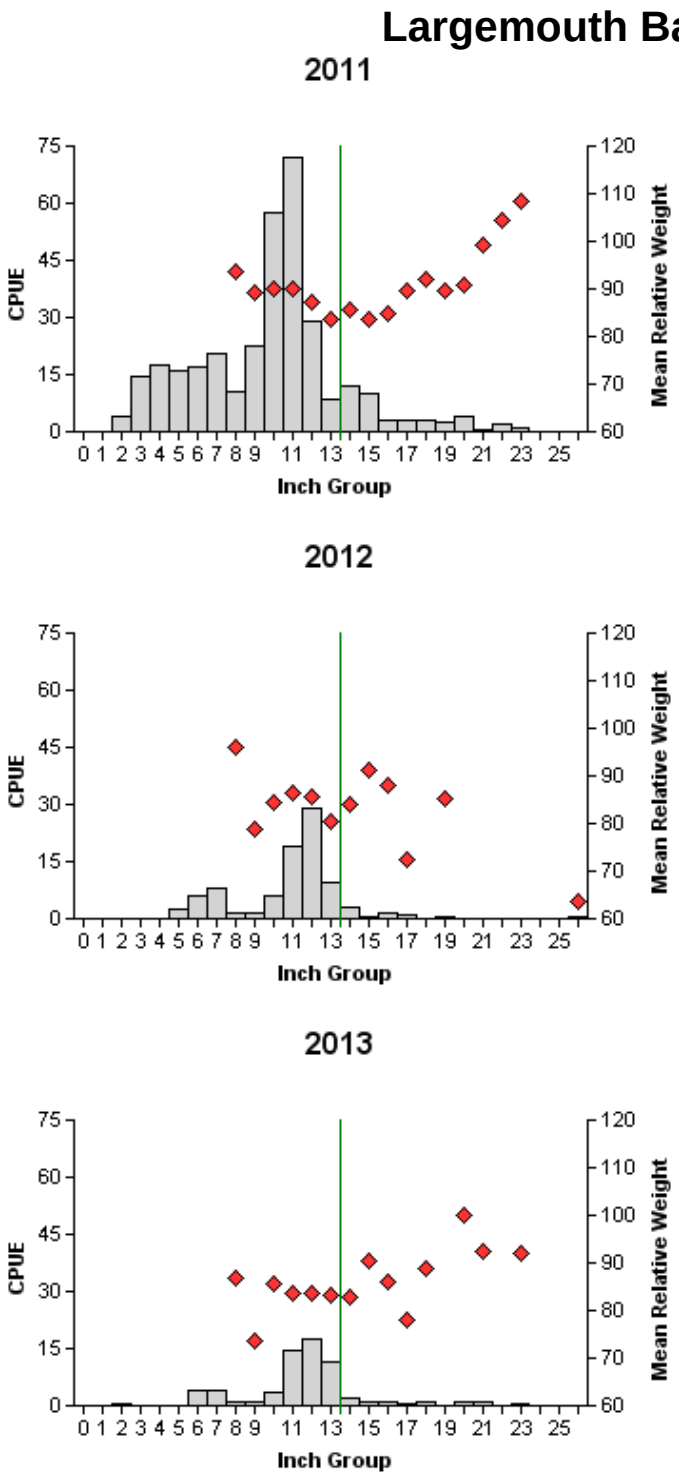


Figure 13. Comparison of the number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Choke Canyon Reservoir, Texas, 2011, 2012, and 2013. Vertical line denotes 14-inch minimum length limit.

Largemouth Bass

Table 12. Mean age at legal length (14 in) for Largemouth Bass collected by fall electrofishing, Choke Canyon Reservoir. Standard deviations are in parenthesis.

Year	N	Age Range	Age-at-Length
2008	53	1 – 4	1.7 (0.79)
2009	13	1 – 3	2.0 (0.40)
2010	15	1 – 3	2.2 (0.77)
2011	13	1 – 4	2.4 (0.86)
2012	13	1 – 4	2.3 (0.75)
2013	14	1 – 4	2.8 (0.70)

Table 13. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Choke Canyon Reservoir, Texas, 2002 – 2007 and 2009 – 2013. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Largemouth Bass genetic composition was determined using electrophoresis prior to 2005 and with micro-satellite DNA since 2005.

Year	Sample size	Number of fish			% FLMB alleles	% NLMB alleles
		FLMB	Intergrade	NLMB		
2002	24	16	8	0	89	11
2003	30	17	13	0	87	13
2004	30	15	15	0	85	15
2005	30	15	15	0	78	22
2006	30	3	27	0	80	20
2007	30	8	22	0	83	17
2009	30	5	25	0	82	18
2010	30	3	27	0	80	20
2011	30	5	25	0	83	17
2012	30	1	29	0	79	21
2013	30	5	25	0	80	20

Largemouth Bass

Table 14. Creel survey statistics for Largemouth Bass at Choke Canyon Reservoir Reservoir, TX from June 2009 through May 2011 and June 2013 through May 2014. Catch rate is for all anglers targeting Largemouth Bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Statistic	2009/2010	2010/2011	2013/2014
Directed angling effort (h)	203,509	133,417	37,826
Non-tournament	142,631 (13)	103,155 (15)	32,736 (22)
Tournament	60,878 (17)	30,262 (19)	5,090 (42)
Angling effort/acre			2.63 (22)
Catch rate (number/h)	0.68 (9)	0.69 (10)	0.49 (22)
Harvest			
Non-tournament harvest	5,217 (36)	5,039 (32)	1,843 (84)
Harvest/acre	0.79 (36)	0.77 (32)	0.13 (84)
Tournament weigh-in and release	11,495 (37)	12,871 (38)	368 (377)
Release by weight			
<4.0 lbs	43,476	31,743	21,684 (70)
4.0-6.9 lbs	3,683	2,934	91 (113)
7.0-9.9 lbs	604	240	113 (86)
≥10.0 lbs	121	112	106 (102)
Percent legal released (non-tournament)	74.1	66.2	66.1

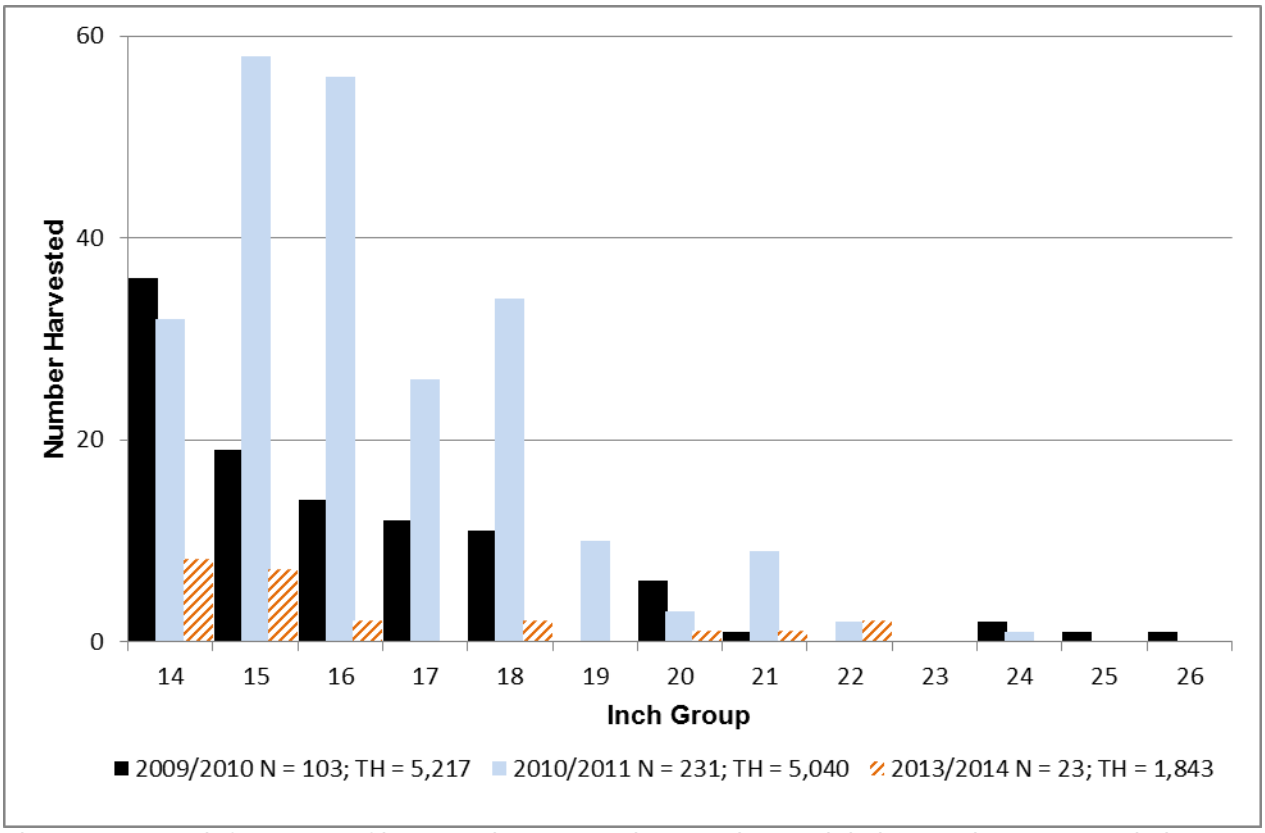


Figure 14. Length frequency of harvested Largemouth Bass observed during creel surveys at Choke Canyon Reservoir, Texas, June 2009 through May 2011 and June 2013 through May 2014, all anglers combined. N is the number of harvested Largemouth Bass observed and TH is the total estimated harvest for the creel period.

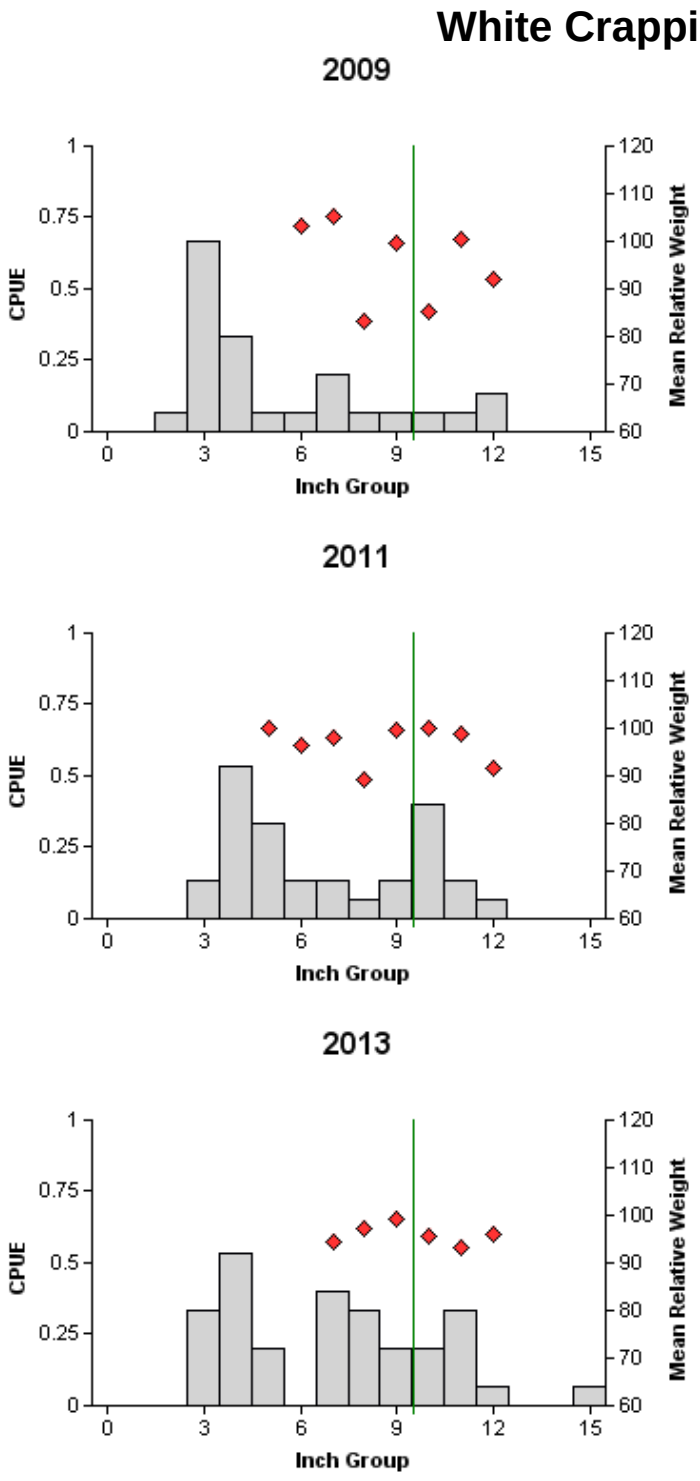


Figure 15. Comparison of the number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Choke Canyon Reservoir, Texas, 2009, 2011, and 2013. Vertical line denotes 10-inch minimum length limit. Biologist-selected sites were used in 2011 survey.

White Crappie

Table 15. Creel survey statistics for White Crappie at Choke Canyon Reservoir from June 2009 through May 2011 and June 2013 through May 2014. Total catch per hour represents anglers targeting White Crappie and total harvest is estimated number of White Crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

	Year		
Creel Survey Statistic	2009/2010	2010/2011	2013/2014
Directed effort (h)	2,395 (40)	743 (65)	6,897 (35)
Directed effort/acre	0.11 (40)	0.03 (65)	0.48 (35)
Average angler catch rate (#/h)	0.62 (61)	0.04 (242)	0.80 (43)
Total harvest	3,850 (113)	612 (219)	8,420 (63)
Harvest/acre	0.18 (113)	0.03 (219)	0.59 (63)

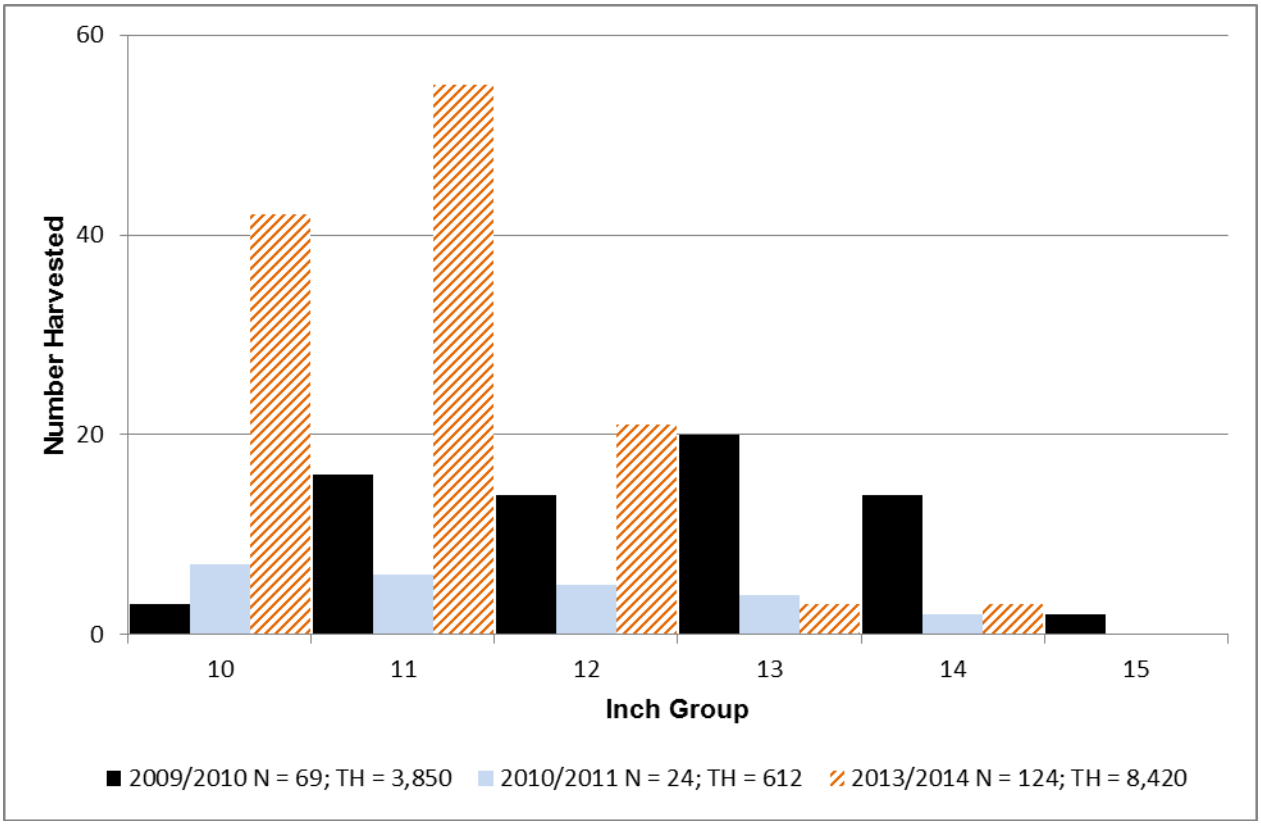


Figure 16. Length frequency of harvested White Crappie observed during creel surveys a Choke Canyon Reservoir, Texas, June 2009 through May 2011 and June 2013 through May 2014, all anglers combined. N is the number of harvested White Crappie observed during creel surveys and TH is the total estimated harvest for the creel period.

Table 16. Proposed survey schedule for Choke Canyon Reservoir, Texas. Survey period is June through May. Creel surveys are conducted over a 12 month period with a total of 36 creel days. Trap netting and electrofishing surveys are conducted in the fall while gill netting surveys are conducted in the spring. Standard surveys are denoted by S and additional surveys denoted by A.

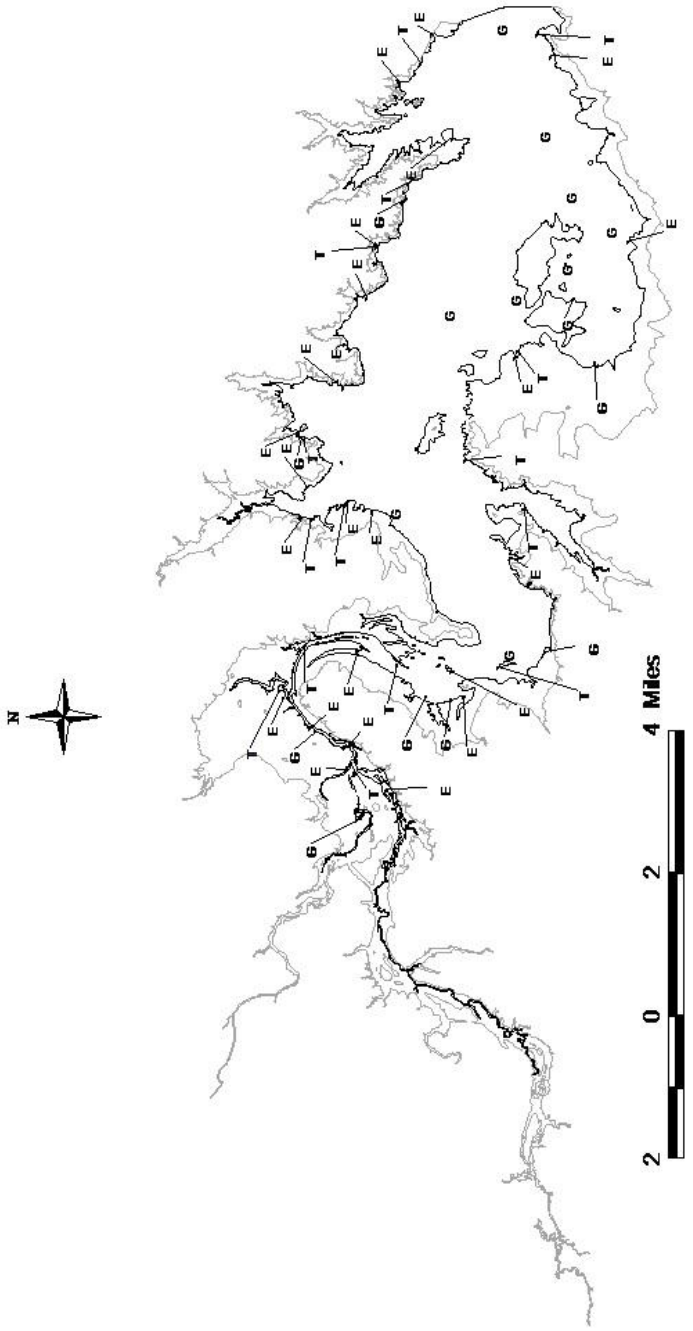
Survey year	Electrofish Fall(Spring)	Trap net	Gill net	Habitat		Access	Creel survey	Report
				Structural	Vegetation			
2014-2015	A		A					
2015-2016	S	S	S		S	S	S	S
2016-2017	A		A					
2017-2018	A	A	A				A	A

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Choke Canyon Reservoir, Texas, 2013-2014. Sampling effort was 14 net nights for gill netting, 15 net nights for trap netting, and 2 hour for electrofishing.

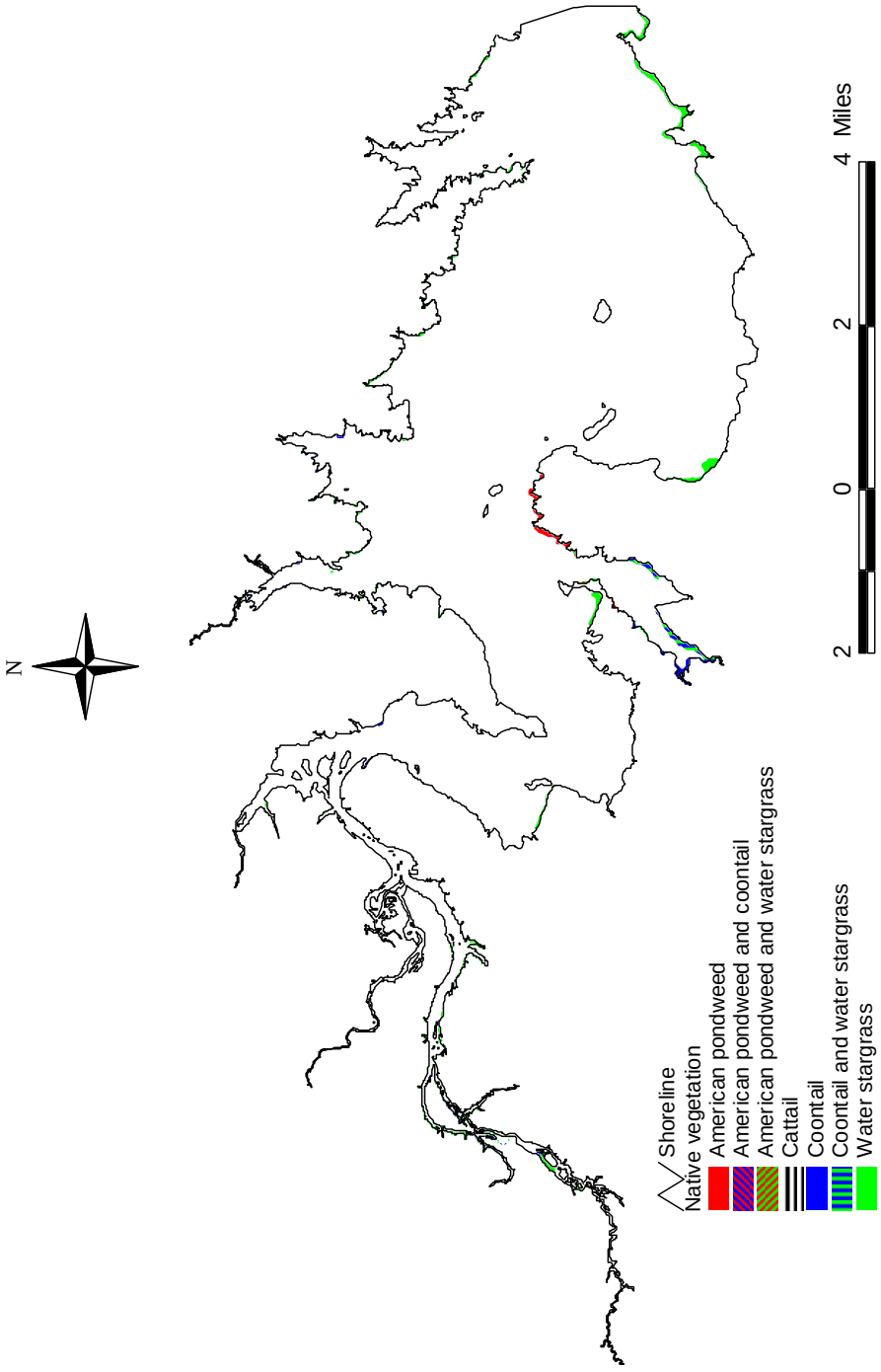
	Electrofishing		Gill Netting		Trap Netting	
Species	CPUE	N	CPUE	N	CPUE	N
Spotted Gar			4.4	61	0.5	7
Longnose Gar			3.0	42		
Gizzard Shad	120.5	241	27.7	388	0.2	3
Threadfin Shad	126.5	253			0.9	14
Common Carp			3.4	48		
Bullhead Minnow	9.0	18				
Inland Silverside	4.5	9				
Smallmouth Buffalo			12.6	177		
Blue Catfish			32.6	457	0.5	7
Channel Catfish			0.9	12	0.1	2
Flathead Catfish			0.5	7		
White Bass	5.0	10	0.4	5		
Bluegill	66.0	132	0.20	3	2.8	42
Longear Sunfish	0.5	1			0.1	1
Redear Sunfish	2.0	4				
Largemouth Bass	65.5	131				
White Crappie	2.5	5	1.7	24	2.7	40
Freshwater Drum			27.8	389	0.7	10
Blue Tilapia	0.5	10				

APPENDIX B



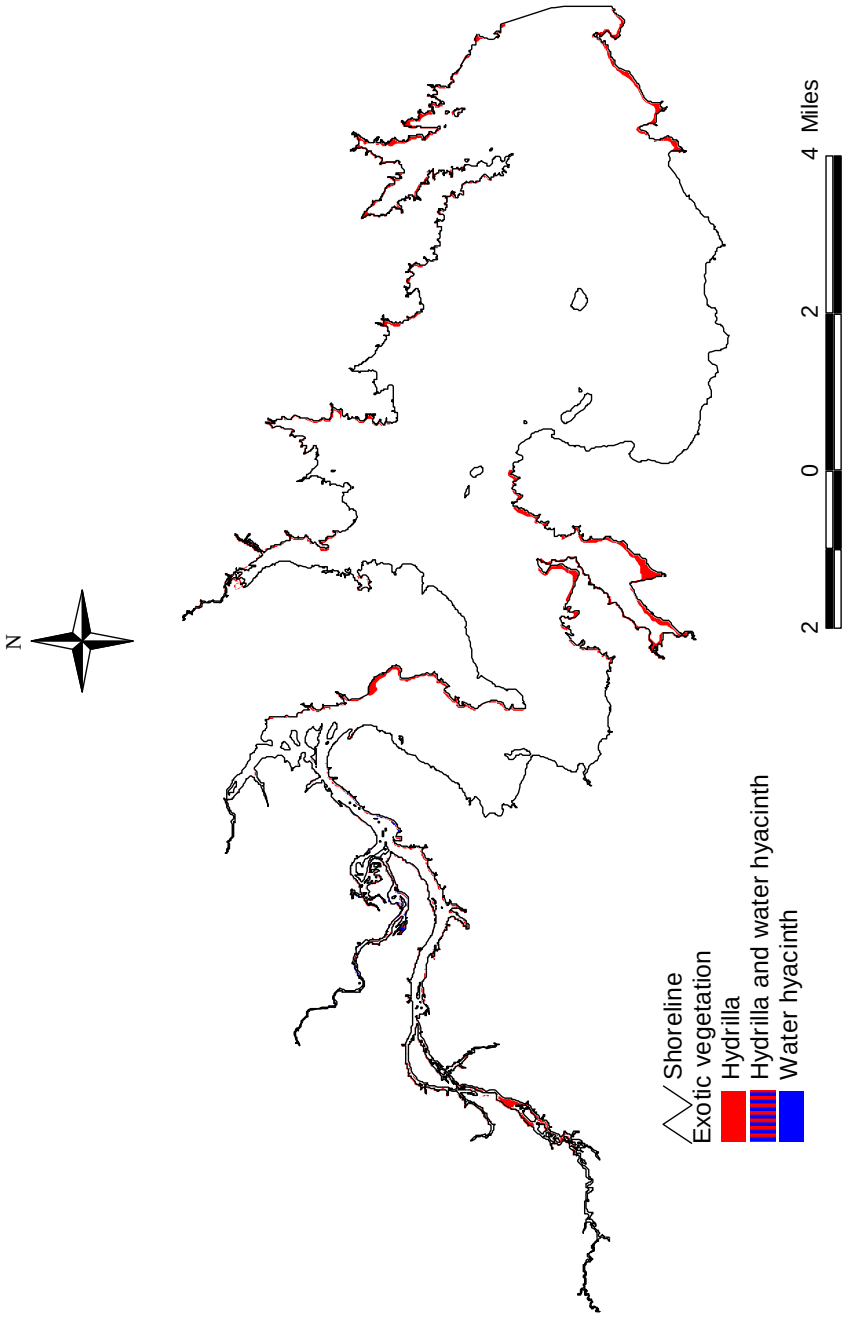
Location of sampling sites, Choke Canyon Reservoir, Texas, 2013-2014. Electrofishing, trap net, and gill net stations are denoted by E, T, and G, respectively. The reservoir was 22.0 feet below conservation pool at time of sampling. Dark line indicates elevation at time of sampling, light line indicates full pool elevation.

APPENDIX C



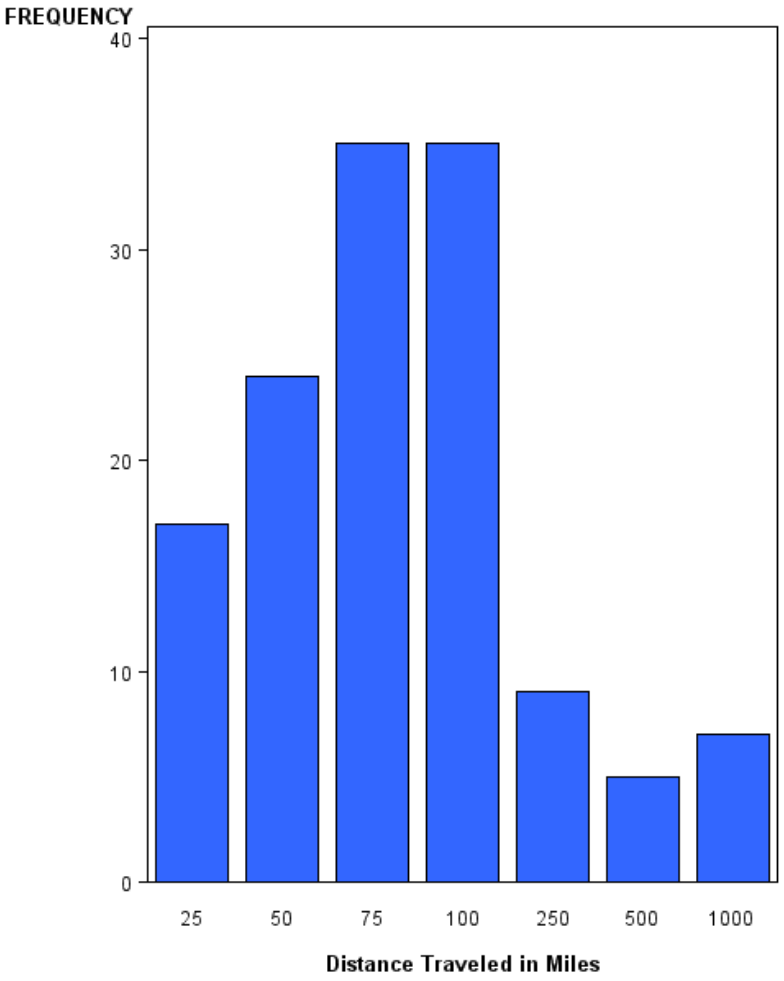
Map of native aquatic vegetation, Choke Canyon Reservoir, Texas, 2011.

APPENDIX D

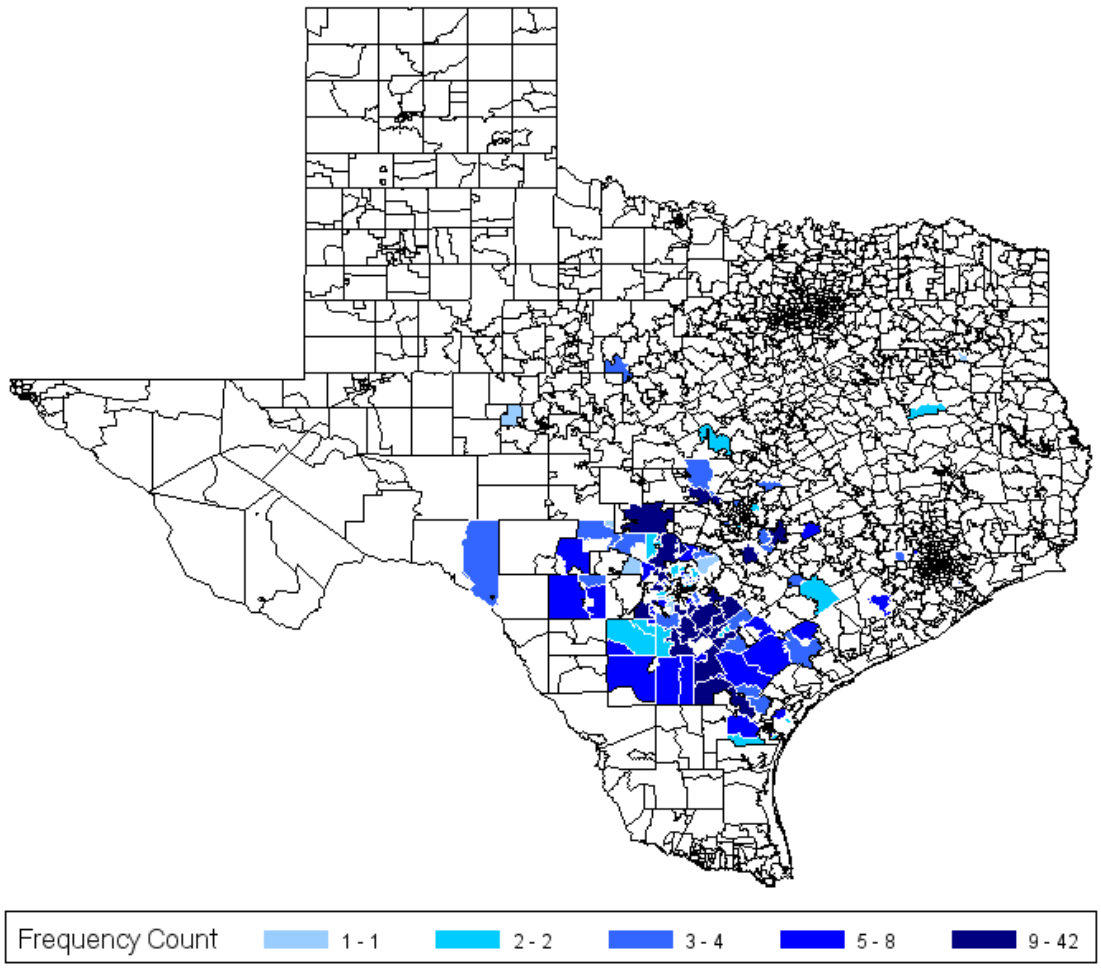


Map of exotic aquatic vegetation, Choke Canyon Reservoir, Texas, 2011.

APPENDIX E



Distance traveled (miles) by frequency to Choke Canyon Reservoir, Texas, as determined from June 2013 through May 2014 creel survey.



Location, by ZIP code, and frequency of anglers that were interviewed at Choke Canyon Reservoir, Texas, during June 2013 through May 2014 creel survey.