

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2013 Fisheries Management Survey Report

Graham Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Graham Reservoir were surveyed in 2013 using electrofishing and trap netting and in 2014 using gill netting. Anglers were surveyed from June 2013 through May 2014 with a creel survey. Historical data are presented with the 2013-2014 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:** Graham Reservoir is a 2,396-acre impoundment located on Salt Creek in the Brazos River Basin approximately two miles northwest of Graham. The water elevation was full in 2012 but has been on a steady decline since and is currently >11 ft. below full pool. Graham Reservoir has moderate to high productivity. Habitat features consisted of natural shoreline, standing timber, and rocks at time of survey. There are three public boat ramps and limited bank-fishing access.
- **Management History:** Important sport fish include White Bass, Palmetto Bass, Largemouth Bass, White Crappie and catfish. Palmetto Bass were stocked in 2011 and 2013. Blue Catfish were introduced into Graham Reservoir sometime in the late 1990s by unknown sources.
- **Fish Community**
 - **Prey species:** Threadfin Shad continued to be present in the reservoir. Electrofishing catch rates of Gizzard Shad were near the historical average and Bluegill were at record lows. Gizzard Shad size structure has continued recent trends towards smaller sizes to where now 89% of the population is vulnerable to predation. Redear Sunfish abundance was down compared to previous surveys.
 - **Catfishes:** Channel Catfish abundance was about average for the reservoir. Blue Catfish abundance has greatly expanded since 2002 and should provide an excellent angling opportunity. Flathead Catfish were present in the reservoir.
 - **Temperate basses:** White Bass and Palmetto Bass were both present in the surveys. The White Bass 2014 gill net catch rate was an all-time high probably because White Bass could not enter the tributaries on their spawning run due to low water conditions, thus they were vulnerable to our sampling gear. Palmetto Bass abundance has been steadily increasing in recent years with good body condition.
 - **Largemouth Bass:** Although catch rate was below the historical average, it was still higher than other district reservoirs. Body condition was fair to good. Largemouth Bass were the second most sought after species in the 2008 and 2013 creel surveys but the number targeting Largemouth Bass decreased by two-thirds with the decrease coming from tournament anglers who were well represented in 2009 but were totally absent from the creel survey in 2013.
 - **Crappie:** White Crappie abundance and size distribution continued to be good. Black Crappie, which were first sampled in 2005, are still present in low abundance. They have become established at Graham and accounted for 10% of the crappie sampled. Crappie were the most sought after species in the last two creel surveys.
- **Management Strategies:** Stock Palmetto Bass every year at a rate of 5-10/acre, depending on prey availability in order to maintain the population. Gill net and electrofish every other year and trap net every four years.

INTRODUCTION

This document is a summary of fisheries data collected from Graham 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. Historical data are presented with the 2013-2014 data for comparison.

Reservoir Description

Graham Reservoir is a 2,396-acre impoundment consisting of two distinct parts often referred to as Graham-Eddleman. The Eddleman dam was completed in 1929 impounding Flint Creek. In 1958, Graham dam was constructed on Salt Creek. The two reservoirs were connected via a canal sometime after June of 1959 creating Graham reservoir. It is located in Young County approximately two miles north of Graham and is operated and controlled by the city of Graham. The reservoir provides municipal and industrial water supply for the city of Graham and water for a steam-electric generating plant, which is on standby status and used only during peak demands. The reservoir is also used for flood control and recreation. Land use around the reservoir includes both residential and agricultural. Graham Reservoir has a watershed of 221 mi². Mean depth is 18.5 ft. with a maximum depth of 49.1 ft. (Sullivan et al. 2003).

Habitat at time of sampling consisted mainly of natural and rocky structure, and standing timber. The water elevation was full in 2012 but has been on a steady decline since and is currently >11 ft. below full pool (Figure 1).

Angler Access

Boat access consisted of three public boat ramps and several private boat ramps. Bank fishing access was restricted to the area around the boat ramps. A user-pay crappie house is available on the Eddleman side of the reservoir. Other descriptive characteristics for Graham Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Howell and Mauk 2010) included:

1. Monitor the Palmetto Bass population every other year and annually stock 5-10 fish/acre depending on prey availability.
Action: Palmetto Bass were requested annually at a rate of 5-10/acre. Gill netting occurred every two years to monitor the population.
2. Increased signage showing how to identify a Palmetto Bass and the minimum length limit were needed as was increased law enforcement.
Action: Posted enhanced signage at public boat ramps, bait shops and fishing dock that details differences between Palmetto and White Bass. Office also contacted local game warden in order to enhance enforcement and educate public.
3. Monitor Largemouth Bass by electrofishing every other year and work with tournament anglers to reduce mortality.
Action: Monitored Largemouth Bass population every two years with an electrofishing survey. Worked with tournament anglers and groups on how to better handle their catch and improve their weigh-in process.
4. The city of Graham needed to be informed of the need for improved and additional boat ramps to meet the need from recreational boaters and be made aware of the TPWD boat ramp grant program.
Action: Consulted with city of Graham about the TPWD boat ramp grant program. The city has been extending the existing ramps and are currently constructing courtesy docks.
5. With the spread of zebra mussels and other invasive species, we wanted to make the public and reservoir authorities aware of what to do to prevent their spread and what to do if they suddenly appear.
Action: Spoke and gave material about invasive species to fishing barge operator.

Published articles about invasives species in local newspaper.

Harvest regulation history: Sport fish in Graham Reservoir have always been managed with statewide regulations (Table 3).

Stocking history: Graham Reservoir has been stocked with Palmetto Bass when available from the hatchery system. The last stocking occurred in 2013. Florida Largemouth Bass were last stocked in 1997. The complete stocking history is in Table 4. There is no record of Blue Catfish having been stocked into the reservoir but they began showing up in the 2002 survey and are now well established.

Vegetation/habitat management history: Graham Reservoir has no significant vegetation or habitat management history.

Water transfer: Graham Reservoir is primarily used for municipal water supply, source to cool a local power plant, recreation, and to a lesser extent, flood control for the City of Graham, Texas. In the past, water was sold to the cities of Newcastle and Bryson for their municipal use. Small amounts of untreated water are also used by Graham waterfront property owners for irrigation purposes. No water is directly transferred to other reservoirs unless the lake elevation exceeds spillway level. In that situation, the excess water flows down the Brazos River to Possum Kingdom Reservoir.

METHODS

Fishes were collected by electrofishing (1 hour at 12, five-minute 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/h) of actual electrofishing and, for gill and trap nets, as the number of fish per net night (fish/nn).

A 12-month roving creel survey was conducted from June 2013-May 2014. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. (2007)], and condition indices [relative weights (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). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Source for water level data was the United States Geological Survey (USGS 2014).

RESULTS AND DISCUSSION

Habitat: A habitat survey was conducted in August 2013 (Table 5). Reservoir elevation at time of survey was 1,067.2 ft. above mean sea level. While aquatic vegetation is usually abundant, because of the low reservoir conditions, no aquatic vegetation was observed.

Creel Survey: A creel survey was conducted from June 2013-May 2014 and the fishery generated an estimated \$199,007 in direct expenditures (Table 6). This is a substantial decrease from the 2008-09 creel value of \$321,209 and can be attributed to the drought that has been on-going in North Texas. Anglers fished an estimated 42,185 hours at the reservoir which is the equivalent of 24.5 hr/acre based on a reservoir acreage of 1,722.4 at time of survey (Table 6). Total angling effort was 64,198 during the 2008-09 creel survey. Crappie spp. were the most sought after fish being targeted by 46.7% of the anglers (Table 7). Largemouth Bass were targeted by 8.6% of anglers while *Morone* species were targeted by 11.2% of the anglers (Table 7). Bass tournaments were popular during the 2008-09 creel survey as indicated by the fact that on 19.4% of the creel days there were

tournaments being held. Among all the interviews from all the creel surveys during the 2008-09 creel survey, 19.1% of the anglers interviewed were actively participating in a tournament at the time of the interview (Howell and Mauk 2010). During the current creel survey, no tournament anglers were encountered, probably in part because of the drought.

Prey species: Electrofishing catch rates of Gizzard Shad and Threadfin Shad were 220.0/h and 274.0/h, respectively (Appendix A). Index of vulnerability (IOV) for Gizzard Shad was 89% which was higher than the IOV estimates in 2011 (73%) and 2009 (66%; Figure 2). Total CPUE of Gizzard Shad (220.0/h) was higher than in 2011 (161.0/h) and near the historical average of 242.6/h. Threadfin Shad abundance (274.0/h) could decline if the power plant continues to function on a standby basis, especially during cold winters. Total CPUE of Bluegill (Figure 3) in 2013 (35.0/h) was the lowest documented and well below the historical average of 209.4/h. The low reservoir elevation at time of sampling could account for the low catch rate. The Redear Sunfish population in 2013 (35.0/h) was nearly identical to the population in 2011 (32.0/h) but lower than the 2009 survey (89.0/h; Figure 4). While in the previous creel survey Redear Sunfish directed effort and harvest was observed, the present creel survey did not document any effort or harvest.

Blue Catfish: Blue Catfish were first collected in Graham Reservoir in 2002 when 11 fish were collected in 15 gill nets, ranging in length from 8 to 20 inches. Blue Catfish abundance continued to increase every survey period until this year (Figure 5). Body condition of legal length Blue Catfish ranged from 91-112 which is an improvement over the 2010 survey when the average relative weight of 12.0- to 19.9-inch Blue Catfish was 89 (N = 25). It appears that Blue Catfish are thriving in Graham Reservoir. While they are thriving in the reservoir, the anglers are not targeting them (Table 8) nor are they harvesting many (Figure 6).

Channel Catfish: The gill net catch rate of Channel Catfish was 1.6/nn in 2014, a slight increase over 2012 (1.0/nn), but lower than in 2010 (2.3/nn; Figure 7). With such a small sample size, it is difficult to infer much about size structure or body condition. It does appear that the population has decreased in abundance while the Blue Catfish population has become established. Channel Catfish were harvested almost four times more often than Blue Catfish during the creel survey (Tables 8-9).

White Bass: The gill net catch rate of White Bass was 10.2/nn in 2014, compared to 0.8/nn in 2012 and 2.2/nn in 2010 (Figure 9). The 2014 catch rate is the highest documented and possibly a product of the reservoir being low and connectivity with the tributaries being non-existent. Thus spawning White Bass had to remain in the reservoir and were more vulnerable to sampling gear compared to past survey years. Body condition was considered good. Size structure of White Bass in terms of legal fish was excellent compared to the previous two surveys (Figure 9). Directed effort decreased by half from the previous survey and harvest was estimated to be one-third of what it was in 2008-09 (Table 10). The power plant effluent was always a popular place to fish for *Morone* spp. but it seldom runs anymore probably accounting for some of the decline in the fishery.

Palmetto Bass: The gill net catch rate of Palmetto Bass increased from 0.2/nn in 2012 to 2.0/nn in 2014 (Figure 11). The overall body condition as measured by relative weight was considered good with all inch groups exceeding 90. The good body condition and prey abundance supports annual stockings of 5-10/acre. Angling effort increased slightly for this species and total catch has doubled but harvest was one-fourth of the previous creel survey (Table 11). Catch and release might be becoming more popular on the reservoir since 34.1% of the legal-length Palmetto Bass caught were released compared to 0.4% during the previous survey (Table 11).

Largemouth Bass: The electrofishing catch rate of stock-length Largemouth Bass (≥ 8 inches) was 95.0/h in 2013, considerably higher than the previous two surveys (Figure 13). Total CPUE in 2013 was 101.0/h, good for the district but slightly below the reservoir historical average (127.6/h). Size structure continues to be excellent with a 2013 PSD of 46. Historically, PSDs have ranged from 32 to 51. The number of legal-length bass sampled increased over the previous survey but the bass were mostly in the 14-inch length category. Mean *Wr* among inch classes ranged from 68 to 90, which is poor but could be a function of the decrease in Bluegill abundance due to the extreme low reservoir elevations. Nearly all creel statistics have decreased from the previous creel survey (Table 12). Appendix C illustrates the decrease in anglers from greater distances from the reservoir, many of which were there for tournaments.

Crappies: The trap net catch rate of White Crappie was 7.8/nn in 2013, higher than in 2009 (4.7/nn) but lower than 2005 (10.0/nn; Figure 15). However, the PSD was 82, which was higher and more desirable than the PSD in 2005 (63). The percentage of legal-size fish has increased over the last three surveys ranging from 20% in 2005, 30% in 2009 and 56% in 2013. Body condition decreased with increasing size of White Crappie indicating a lack of prey in the size range needed by larger crappie.

A single 10-inch Black Crappie was sampled in 2005, the first documented observation of this species on record. In 2006, during a crappie capture study 20 black crappie between 7-9 inches were sampled. In 2013, we had a catch rate of 0.8/nn, down from 2009 (1.6/nn; Figure 16). Body condition as measured by *Wr* for all inch groups was above 90. However, no Black Crappie were above the legal length limit of 10-inches.

Crappie spp. had the highest directed effort at 46.7% by anglers during the creel survey which is an increase from the previous survey of 33.6%. Directed effort was slightly down from the previous survey but harvest was up (Table 13).

Fisheries management plan for Graham Reservoir, Texas

Prepared – July 2014

ISSUE 1 Palmetto Bass have been increasing in size and abundance at Graham Reservoir. The body condition as measured by relative weight has been excellent in the last two surveys. Past stocking rates have been conservative and none were stocked in 2009, 2010, or 2012. It now appears that stocking frequency could be increased to further enhance the fishery.

MANAGEMENT STRATEGIES

1. Request Palmetto Bass at a rate of 5-10 fish/acre every year depending on prey availability.
2. Monitor with gill nets every other year to ensure continued good growth and body condition.

ISSUE 2 Largemouth Bass relative abundance fluctuates greatly at this reservoir and body condition is of concern. While CPUE and size structure of shad is considered good, sunfish populations are down, probably caused by low reservoir elevation. The reservoir has been a very popular tournament site (Howell and Mauk 2010). The results of the 2008-2009 creel survey showed that the ratio of tournament angler caught to non-tournament angler harvested bass exceeded 3:1 which Allen et al. 2004 identified as the threshold at which Largemouth Bass size structure could decline because of tournament mortality affecting legal length and above bass. Poor handling practices were observed for some tournament in the previous survey.

MANAGEMENT STRATEGY

1. Continue to monitor Largemouth Bass and shad populations frequently by conducting electrofishing surveys every other year. This enhanced monitoring is expected to provide further evidence that may lead to more intensive management actions in the future. Additionally, work directly with tournament angler groups on methods for enhancing fish survival from tournaments.

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 Graham to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters and literature 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.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes standard monitoring in 2017/2018. Additional electrofishing will occur in 2015 to monitor Largemouth Bass, sunfish, and shad populations and gill netting will occur in 2016 to monitor Palmetto Bass populations (Table 21).

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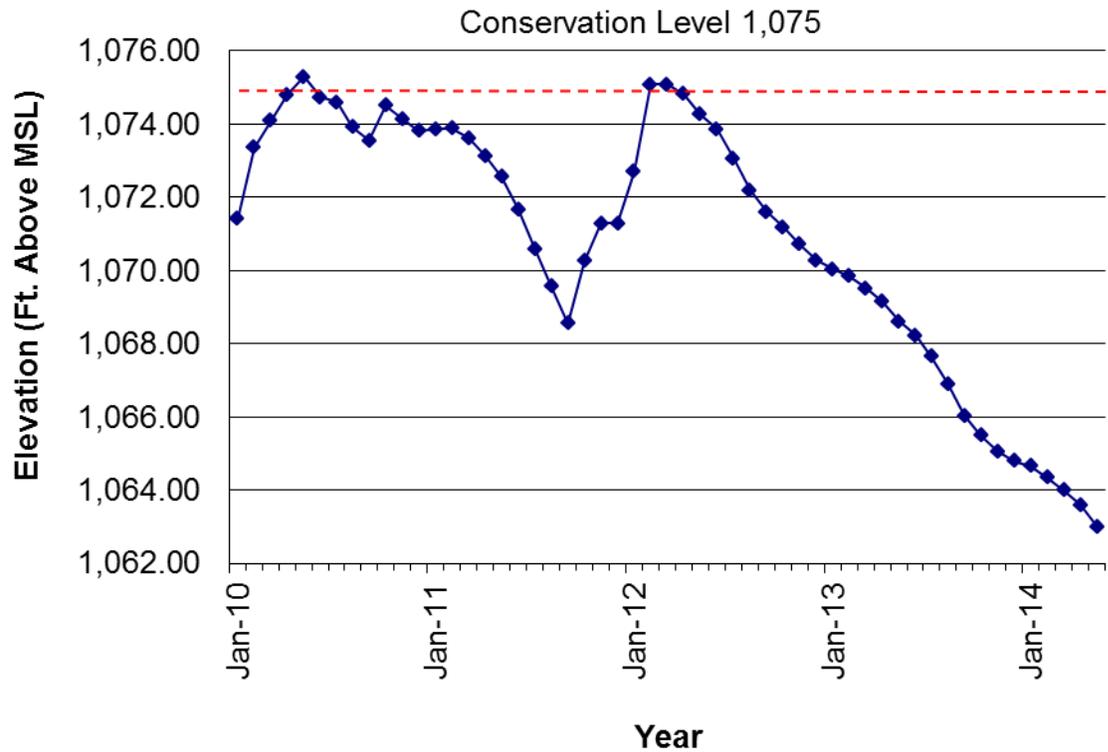


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Graham Reservoir, Texas.

Table 1. Characteristics of Graham Reservoir, Texas.

Characteristic	Description
Year Constructed	1929
Controlling authority	City of Graham
Counties	Young
Reservoir type	Tributary
Shoreline Development Index (SDI)	3.25
Conductivity	595 $\mu\text{mhos/cm}$

Table 2. Boat ramp characteristics for Graham Reservoir, Texas, August, 2013. Reservoir elevation at time of survey was 1,067.2 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Eddleman	33.13597 -98.60117	Y	>100	1064	City currently dredging bottom of ramp
Lake Graham Public Ramp	33.13244 -98.62733	Y	20	1062	Good, city has dredged out from ramp
White Rose Boat Ramp	33.1667 -98.63117	Y	40	Unknown	Out of water. Extension is feasible

Table 3. Harvest regulations for Graham Reservoir.

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	5	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Graham, 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.

Species	Year	Number	Life Stage	Mean TL (in)
Channel Catfish	1970	50,000	AFGL	7.9
	Total	50,000		
Florida Largemouth Bass	1979	50,022	FRY	1.0
	1992	151,869	FRY	1.0
	1994	150,217	FGL	1.3
	1997	151,247	FGL	1.5
	Total	503,355		
Largemouth Bass	1966	303,000	FRY	0.7
	1967	60,000	UNK	UNK
	1969	10,000	UNK	UNK
	1970	50,000	UNK	UNK
	1971	4,000	UNK	UNK
	Total	427,000		
Palmetto Bass (Striped X White Bass hybrid)	1979	100,000	UNK	UNK
	1981	100,000	UNK	UNK
	1983	148,500	UNK	UNK
	1985	60,600	FGL	2.0
	1986	59,900	FRY	1.0
	1987	59,900	FRY	1.0
	1988	60,868	FRY	1.0
	1989	69,426	FGL	1.2
	1991	56,235	FGL	1.3
	1992	25,415	FGL	1.3
	1994	46,350	FGL	1.5
	1995	52,277	FGL	1.5
	1996	45,334	FGL	1.7
	1997	30,974	FGL	1.7
	1998	30,536	FGL	1.4
	1999	22,655	FGL	1.4
	2002	15,050	FGL	1.8
	2004	16,816	FGL	1.5
	2005	12,867	FGL	1.6
	2006	12,000	FGL	1.7
2007	24,001	FGL	1.4	
2008	17,272	FGL	1.4	
2011	18,343	FGL	1.3	
2013	24,228	FGL	1.8	
Total	1,109,547			

Table 5. Survey of structural habitat types, Graham Reservoir, Texas, 2013. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Rock bluff	0.4 miles	1.5
Rocky shore with boat docks	4.0 miles	14.3
Natural	15.9 miles	57.2
Rocky	7.5 miles	26.9
Standing timber	535.5 acres	22.3

Table 6. Total fishing effort (h) for all species and total directed expenditures at Graham Reservoir, Texas, 2008 and 2013. Survey periods were from 1 June, 2008 through 31 May, 2009 and 1 June, 2013 through 31 May, 2014. Relative standard error is in parentheses.

Creel statistic	2008/2009	2013/2014
Total fishing effort	64,197.9 (12)	42,184.7 (16)
Total directed expenditures	\$321,209 (26)	\$199,007 (31)

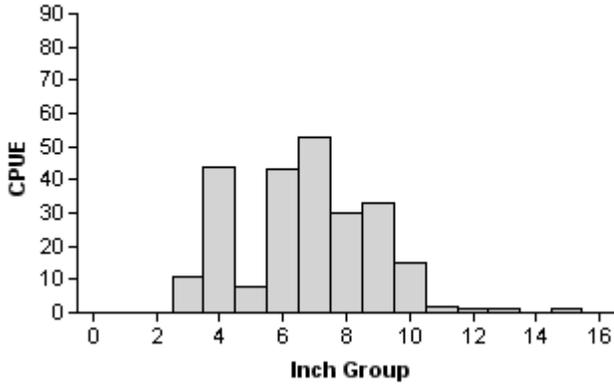
Table 7. Percent directed angler effort by species for Graham Reservoir, Texas, 2008 and 2013. Survey periods were from 1 June, 2008 through 31 May, 2009 and 1 June, 2013 through 31 May, 2014.

Species	2008/2009	2013/2014
Blue Catfish	0.2	0.0
Channel Catfish	1.8	0.8
Flathead Catfish	0.3	0.0
Catfish spp.	0.0	7.4
White Bass	7.6	5.3
Palmetto Bass	2.1	4.5
Temperate Bass	3.8	1.4
Redear Sunfish	0.9	0.0
Largemouth Bass	25.1	8.6
Crappie spp.	33.6	46.7
Anything	18.0	25.2

Gizzard Shad

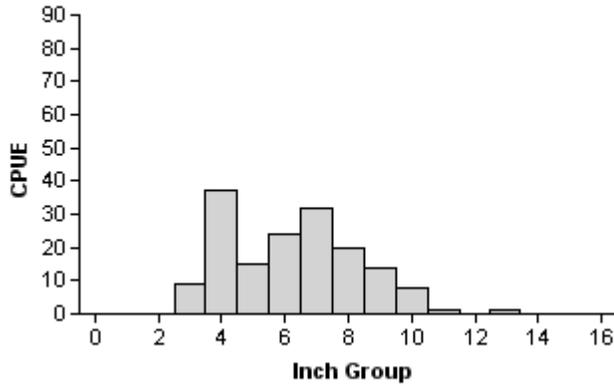
2009

Effort = 1.0
 Total CPUE = 242.0 (19; 242)
 Stock CPUE = 136.0 (25; 136)
 PSD = 4 (1.9)
 IOV = 66 (4.2)



2011

Effort = 1.0
 Total CPUE = 161.0 (18; 161)
 Stock CPUE = 76.0 (27; 76)
 PSD = 3 (1.7)
 IOV = 73 (4.7)



2013

Effort = 1.0
 Total CPUE = 220.0 (24; 220)
 Stock CPUE = 57.0 (44; 57)
 PSD = 2 (2)
 IOV = 89 (3.1)

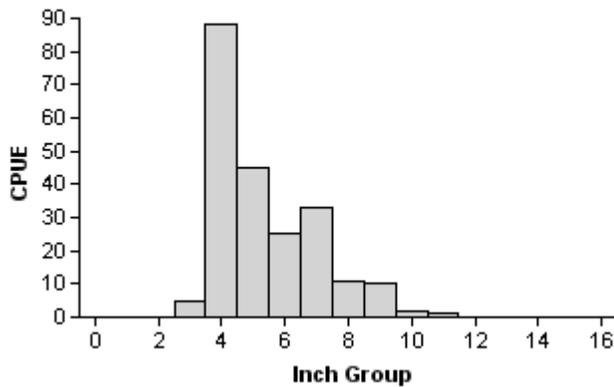


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2009, 2011, and 2013.

Bluegill

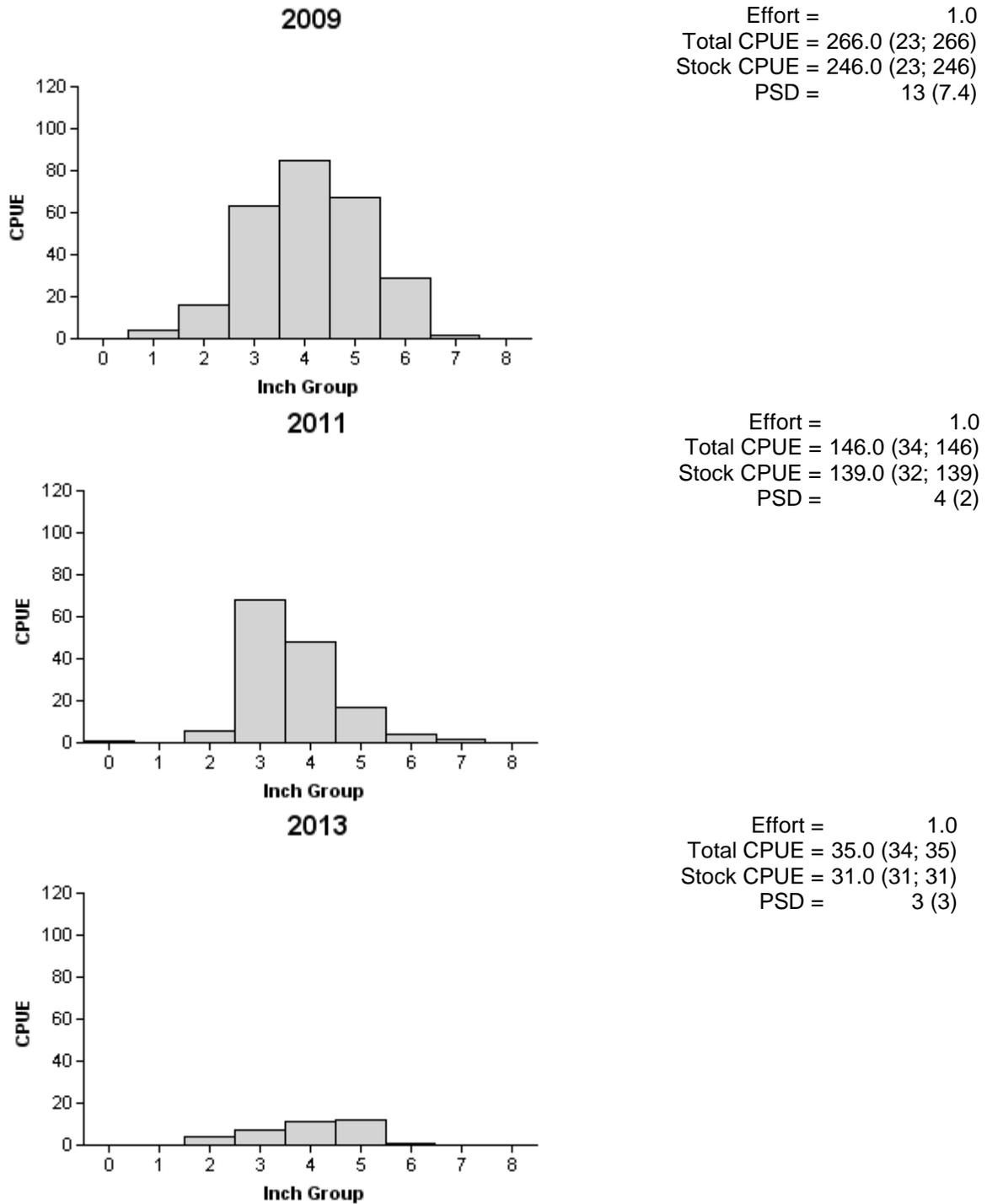
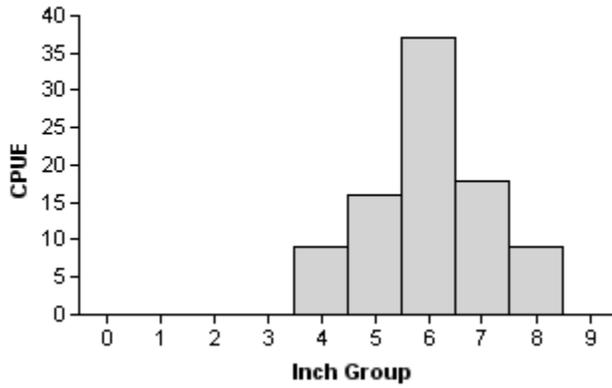


Figure 3. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2009, 2011, and 2013.

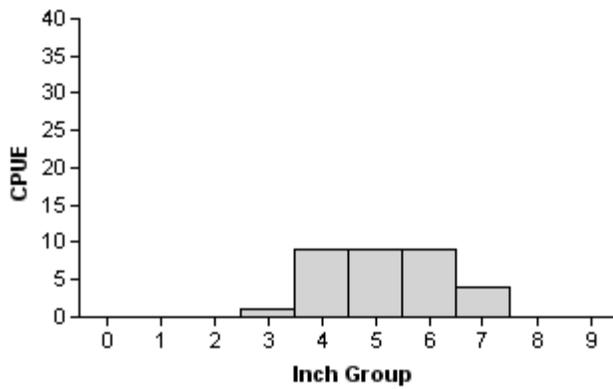
Redear Sunfish

2009



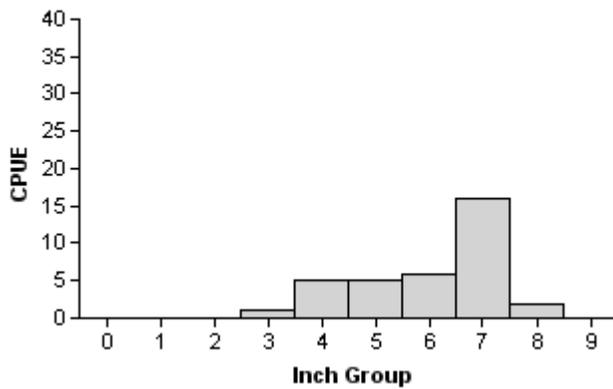
Effort = 1.0
 Total CPUE = 89.0 (17; 89)
 Stock CPUE = 89.0 (17; 89)
 PSD = 30 (9.7)

2011



Effort = 1.0
 Total CPUE = 32.0 (35; 32)
 Stock CPUE = 31.0 (36; 31)
 PSD = 13 (8.3)

2013

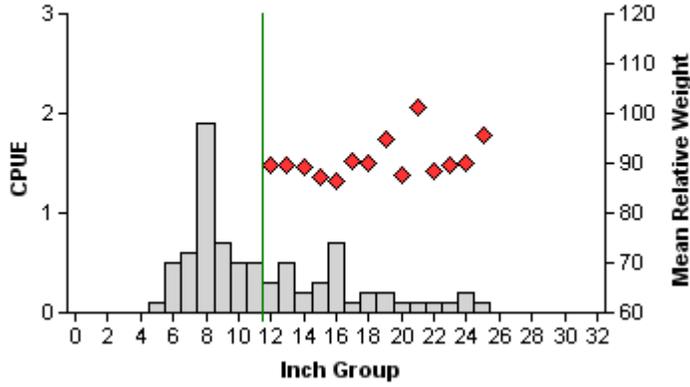


Effort = 1.0
 Total CPUE = 35.0 (30; 35)
 Stock CPUE = 34.0 (29; 34)
 PSD = 53 (13.2)

Figure 4. 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, Graham Reservoir, Texas, 2009, 2011, and 2013.

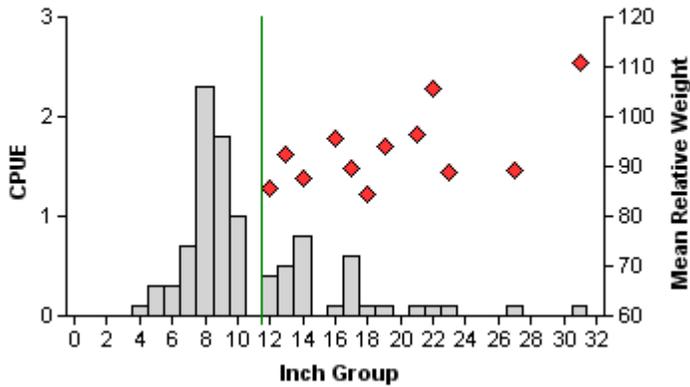
Blue Catfish

2010



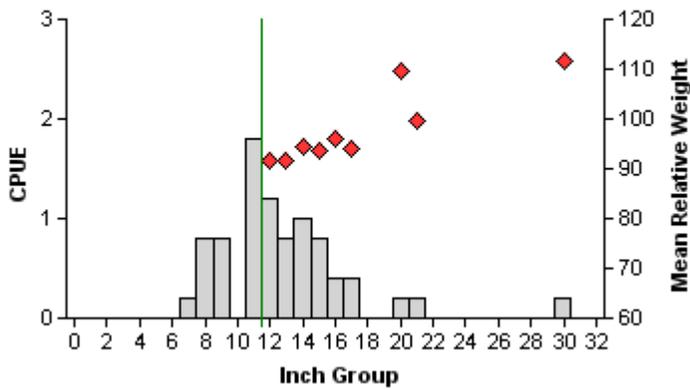
Effort = 10.0
 Total CPUE = 8.0 (19; 80)
 Stock CPUE = 3.2 (21; 32)
 PSD = 22 (2.9)

2012



Effort = 10.0
 Total CPUE = 9.6 (34; 96)
 Stock CPUE = 3.1 (27; 31)
 PSD = 16 (8.2)

2014



Effort = 5.0
 Total CPUE = 8.8 (41; 44)
 Stock CPUE = 5.2 (51; 26)
 PSD = 12 (10.3)

Figure 5. 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, Graham Reservoir, Texas, 2010, 2012, and 2014.

Blue Catfish

Table 8. Creel survey statistics for Blue Catfish at Graham Reservoir from June 2008 through May 2009 and June 2013 through May 2014. Total catch per hour is for anglers targeting Blue Catfish and total harvest is the estimated number of Blue Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses. Acreage during the 2013/2014 creel survey was 1,722.4.

Creel survey statistic	Year	
	2008/2009	2013/2014
Directed effort (h)	151.8 (145.5)	0.0
Directed effort/acre	0.1 (145.5)	0.0
Total catch per hour	0.0	0.0
Total harvest	137.9 (347.4)	338.0 (315.0)
Harvest/acre	0.1 (347.4)	0.2 (315.0)
Percent legal released	0.0	2.3

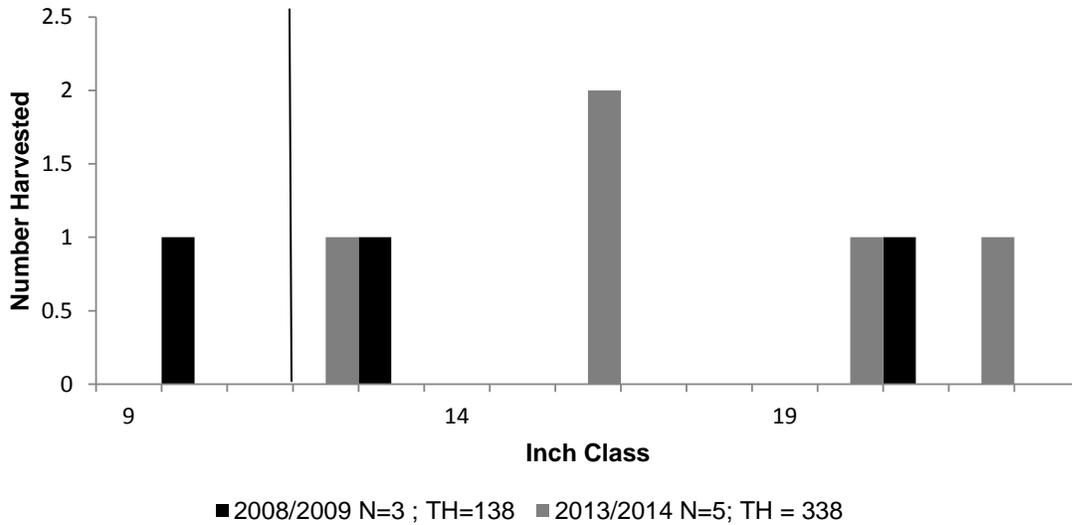


Figure 6. Length frequency of harvested Blue Catfish observed during creel surveys at Graham Reservoir, Texas, June 2008 through May 2009 and June 2013 through May 2014, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Channel Catfish

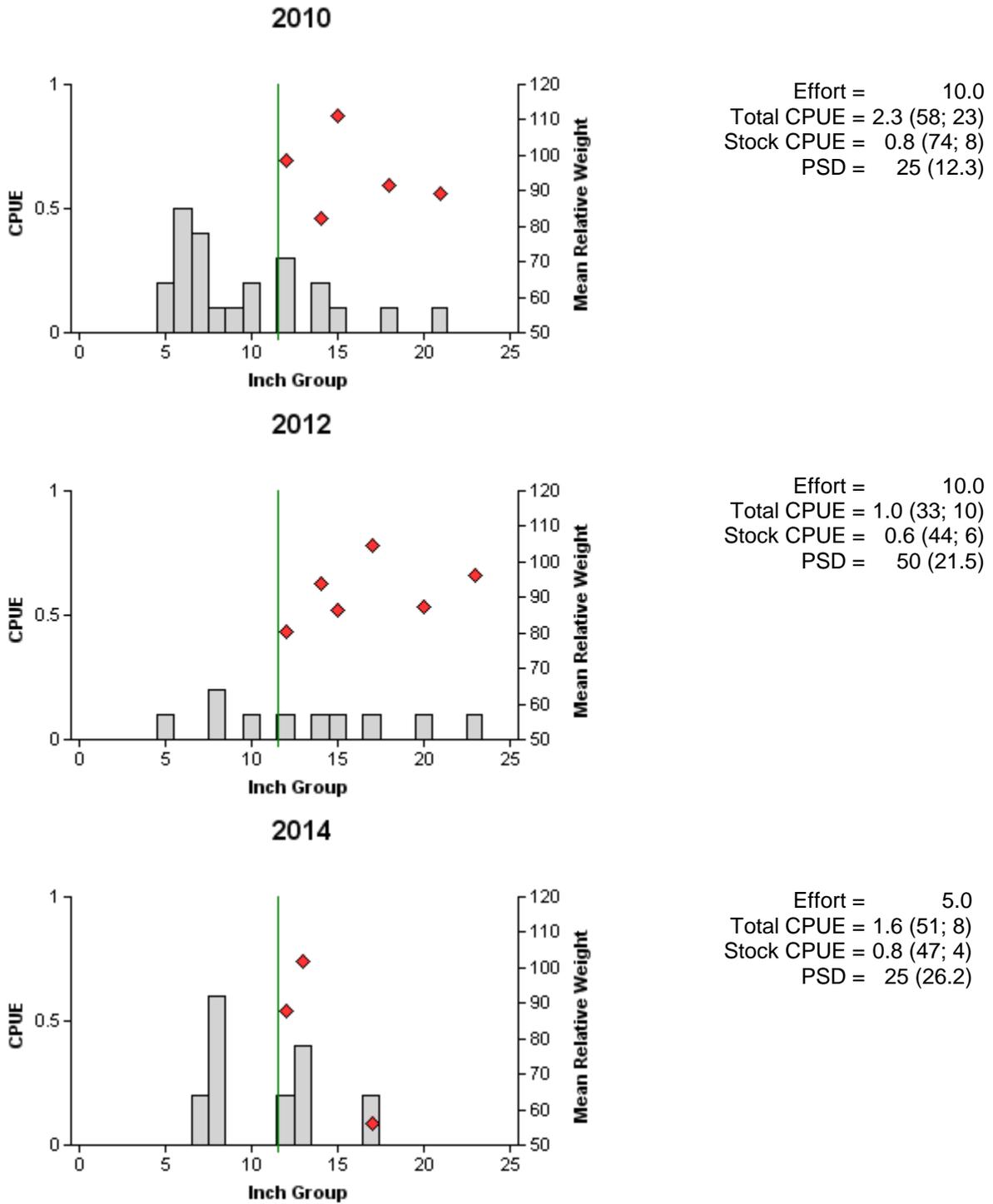


Figure 7. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2010, 2012, and 2014.

Channel Catfish

Table 9. Creel survey statistics for Channel Catfish at Graham Reservoir from June 2009 through May 2010 and June 2013 through May 2014. Total catch per hour is for anglers targeting Channel Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses. Acreage during the 2013/2014 creel survey was 1,722.4.

Creel survey statistic	Year	
	2008/2009	2013/2014
Directed effort (h)	1,157.5 (49.2)	341.9 (91.2)
Directed effort/acre	0.5 (49.2)	0.2 (91.2)
Total catch per hour	1.1 (113.1)	0.8 (-)
Total harvest	948.7 (86.8)	1,137.3 (94.04)
Harvest/acre	0.4 (86.8)	0.7 (94.04)
Percent legal released	0.9	0.9

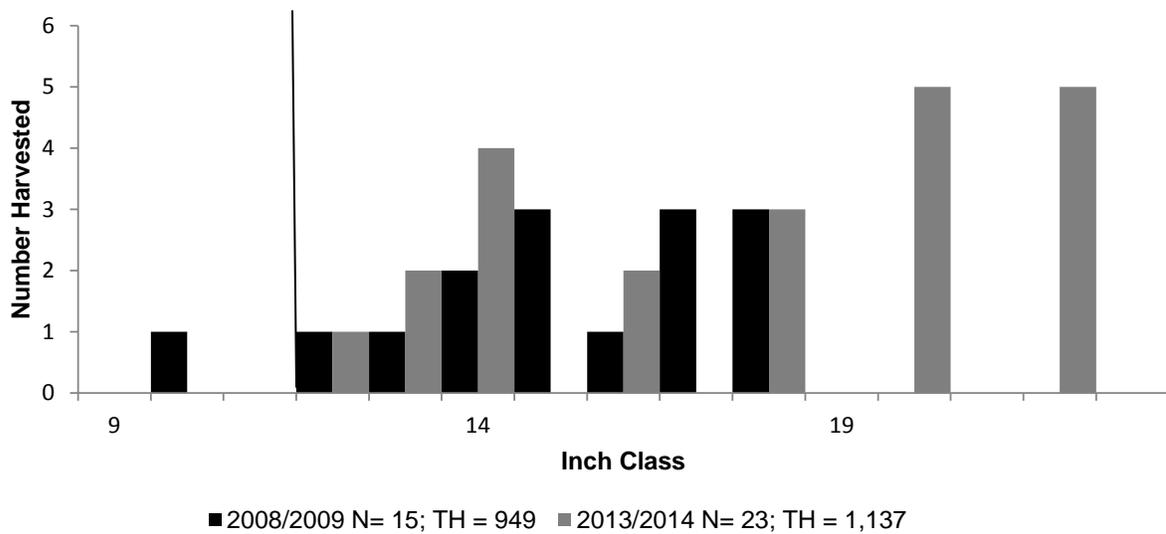


Figure 8. Length frequency of harvested Channel Catfish observed during creel surveys at Graham Reservoir, Texas, June 2008 through May 2009 and June 2013 through May 2014, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

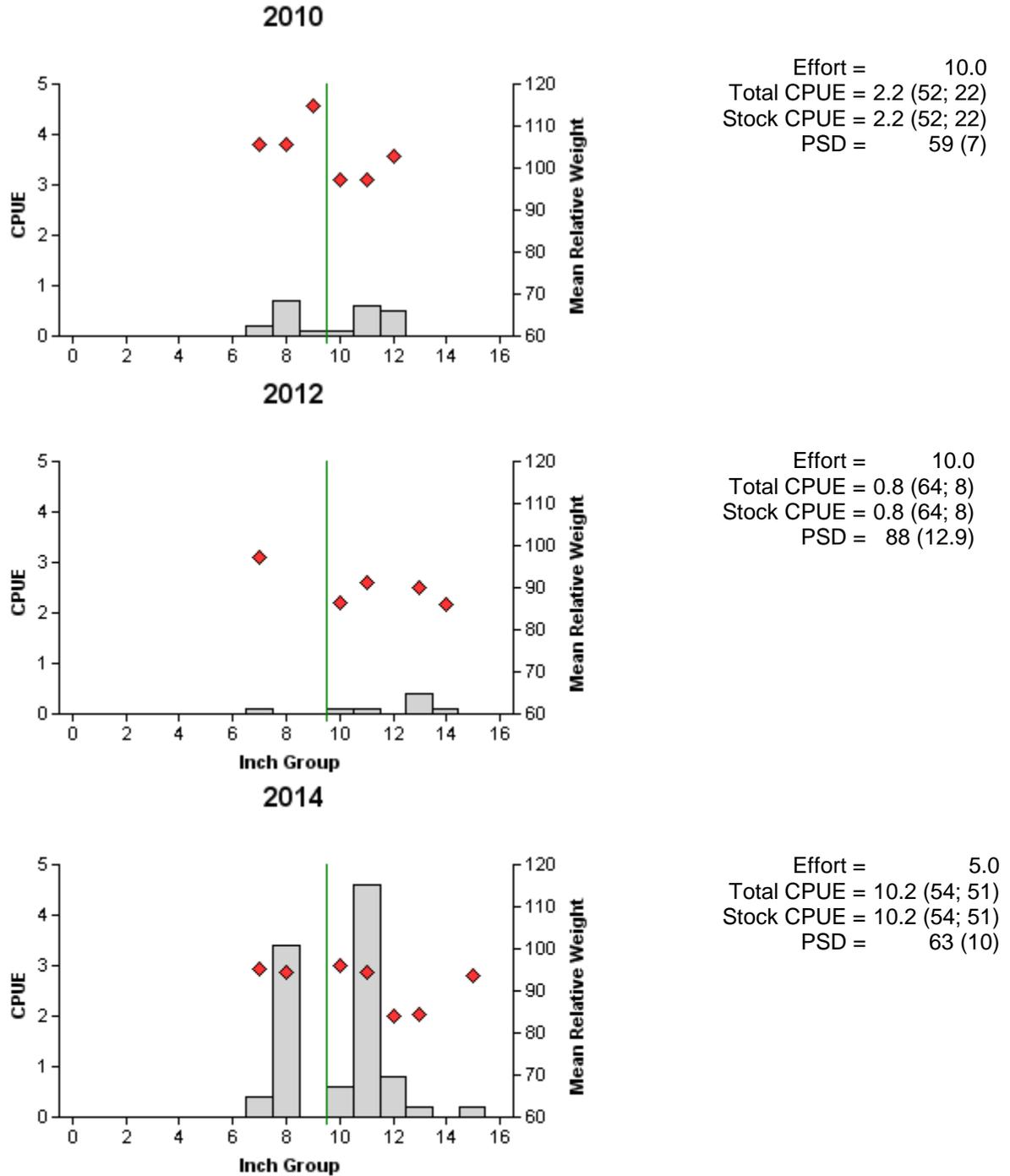


Figure 9. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2010, 2012, and 2014.

White Bass

Table 10. Creel survey statistics for White Bass at Graham Reservoir from June 2008 through May 2009 and June 2013 through May 2014. Total catch per hour is for anglers targeting White Bass and total harvest is the estimated number of White Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses. Acreage during the 2013/2014 creel survey was 1,722.4.

Creel survey statistic	Year	
	2008/2009	2013/2014
Directed effort (h)	4,853.0 (25.1)	2,254.2 (35.8)
Directed effort/acre	2.0 (25.1)	1.3 (35.8)
Total catch per hour	2.6 (26.1)	3.4 (60.6)
Total harvest	10,688.5 (30.4)	3,576.4 (40.8)
Harvest/acre	4.5 (30.4)	2.1 (40.8)
Percent legal released	68.3	34.1

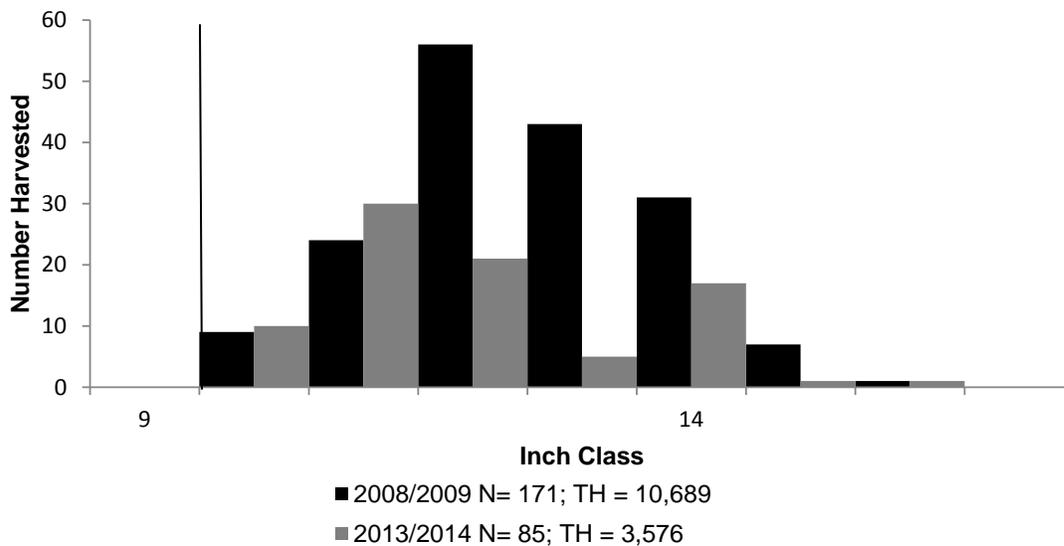
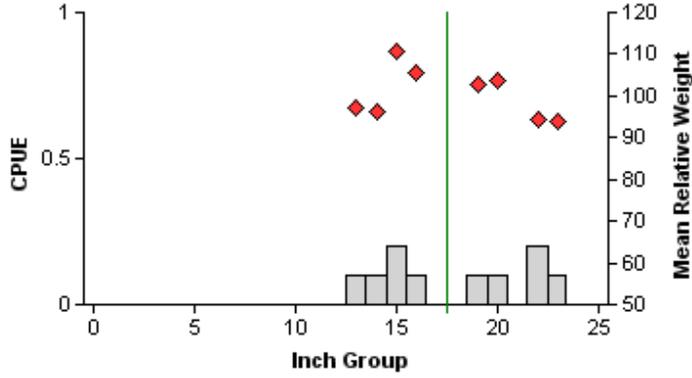


Figure 10. Length frequency of harvested White Bass observed during creel surveys at Graham Reservoir, Texas, June 2008 through May 2009 and June 2013 through May 2014, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

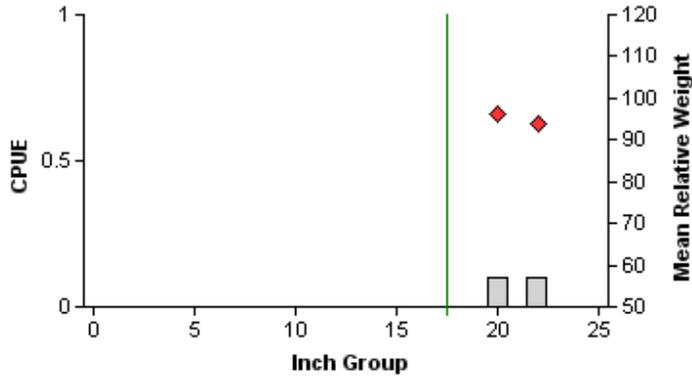
Palmetto Bass

2010



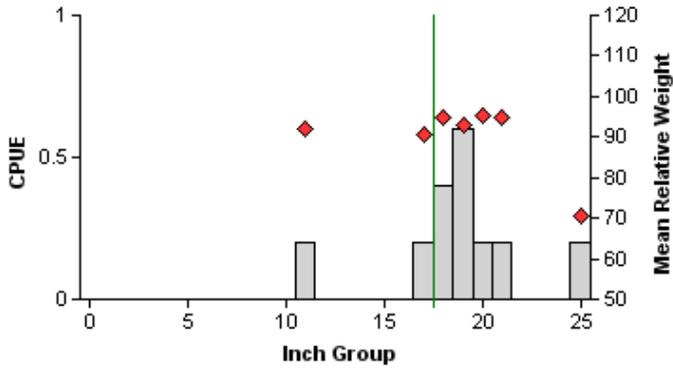
Effort = 10.0
 Total CPUE = 1.0 (37; 10)
 Stock CPUE = 1.0 (37; 10)
 PSD = 60 (20.9)

2012



Effort = 10.0
 Total CPUE = 0.2 (67; 2)
 Stock CPUE = 0.2 (67; 2)
 PSD = 100 (0)

2014



Effort = 5.0
 Total CPUE = 2.0 (88; 10)
 Stock CPUE = 2.0 (88; 10)
 PSD = 90 (1.6)

Figure 11. Number of Palmetto 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, Graham Reservoir, Texas, 2010, 2012, and 2014.

Palmetto Bass

Table 11. Creel survey statistics for Palmetto Bass at Graham Reservoir from June 2008 through May 2009 and June 2013 through May 2014. Total catch per hour is for anglers targeting Palmetto Bass and total harvest is the estimated number of Palmetto Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses. Acreage during the 2013/2014 creel survey was 1,722.4.

Creel survey statistic	Year	
	2008/2009	2013/2014
Directed effort (h)	1,375.0 (42.2)	1,917.5 (41.5)
Directed effort/acre	0.6 (42.2)	1.1 (41.5)
Total catch per hour	0.4 (80.2)	0.8 (70.1)
Total harvest	2,091.3 (74.5)	427.4 (114.5)
Harvest/acre	0.9 (74.5)	0.2 (114.5)
Percent legal released	0.4	34.1

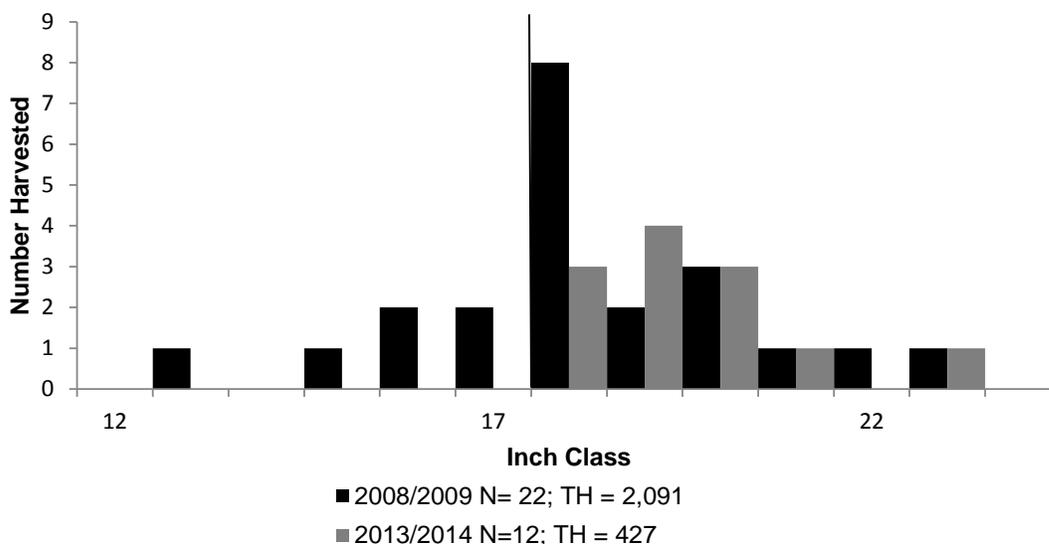


Figure 12. Length frequency of harvested Palmetto Bass observed during creel surveys at Graham Reservoir, Texas, June 2008 through May 2009 and June 2013 through May 2014, all anglers combined. N is the number of harvested Palmetto Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

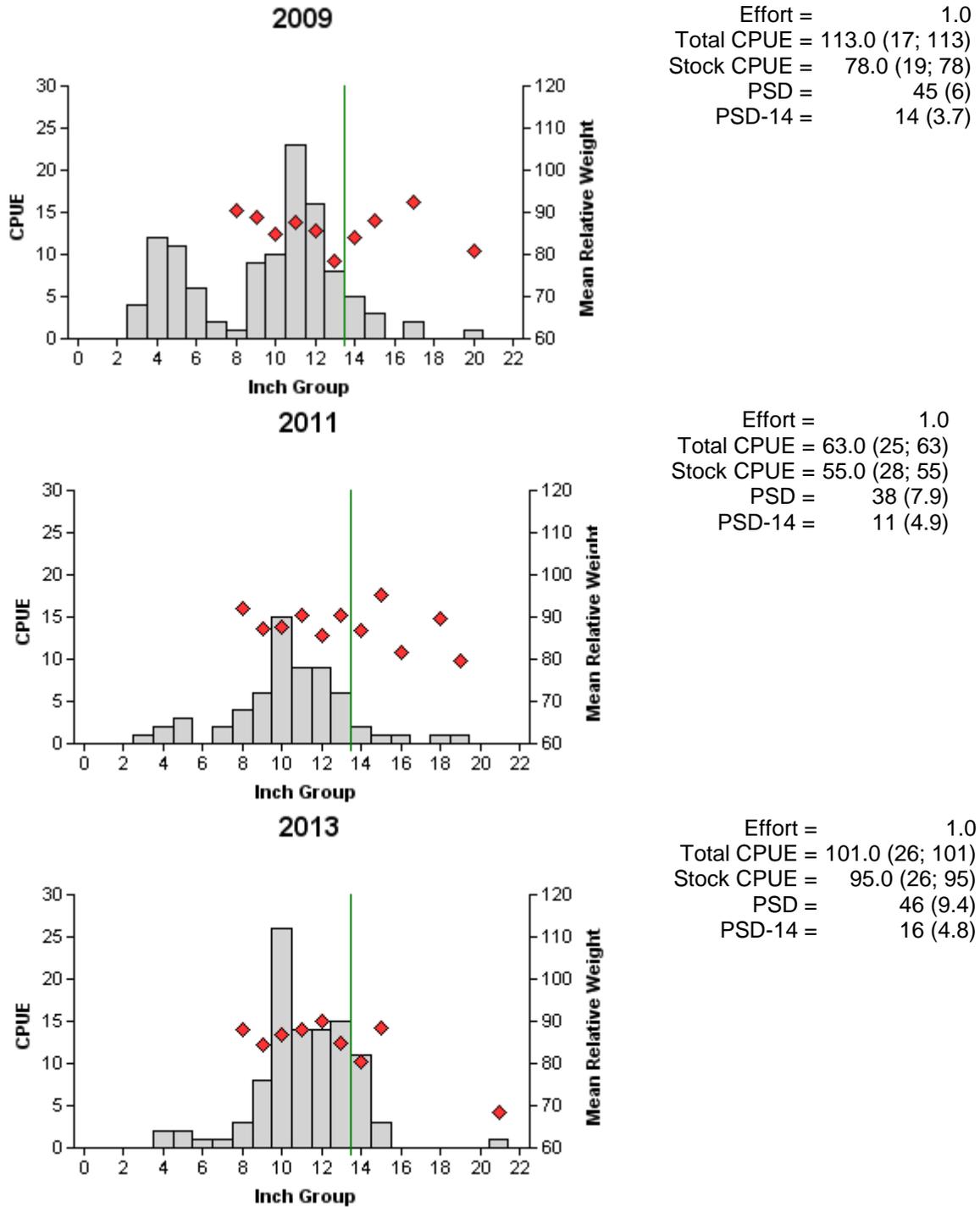


Figure 13. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2009, 2011, and 2013.

Largemouth Bass

Table 12. Creel survey statistics for Largemouth Bass at Graham Reservoir from June 2008 through May 2009, and June 2013 through May 2014. Total catch per hour is for anglers targeting Largemouth Bass and total harvest is the estimated number of Largemouth Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses. Acreage during the 2013/2014 creel survey was 1,722.4.

Creel survey statistic	Year	
	2009/2010	2011/2012
Directed effort (h)	16,101.1 (26.2)	3,627.5 (29.8)
Directed effort/acre	6.7 (26.2)	2.1 (29.8)
Total catch per hour	0.7 (24.7)	1.1 (49.7)
Total harvest	3,104.1 (41.7)	712.9 (68.6)
Harvest/acre	1.3 (41.7)	0.4 (68.6)
Percent legal released	6.4	20.6

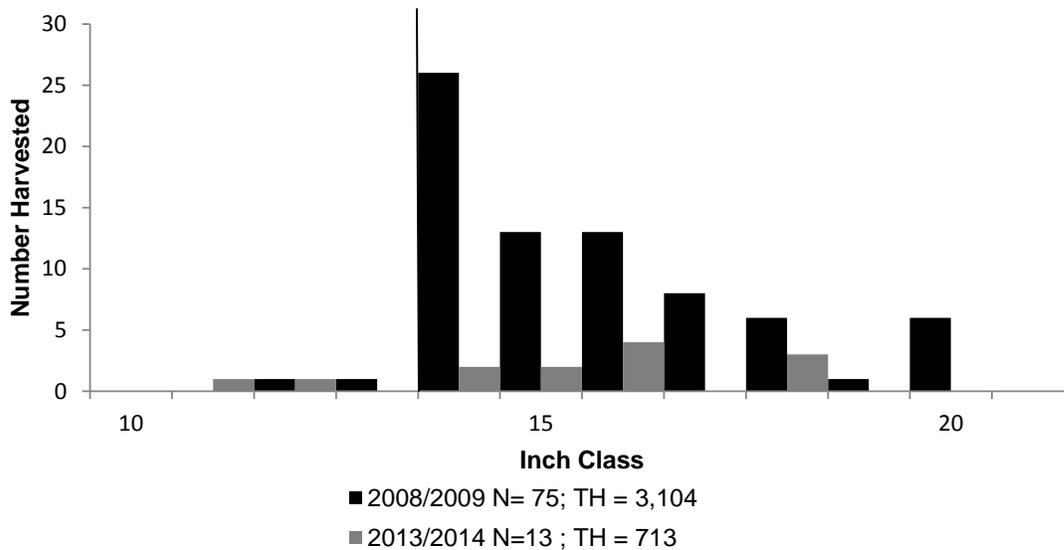


Figure 14. Length frequency of harvested Largemouth Bass observed during creel surveys at Graham Reservoir, Texas, June 2008 through May 2009 and June 2013 through May 2014, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Crappie

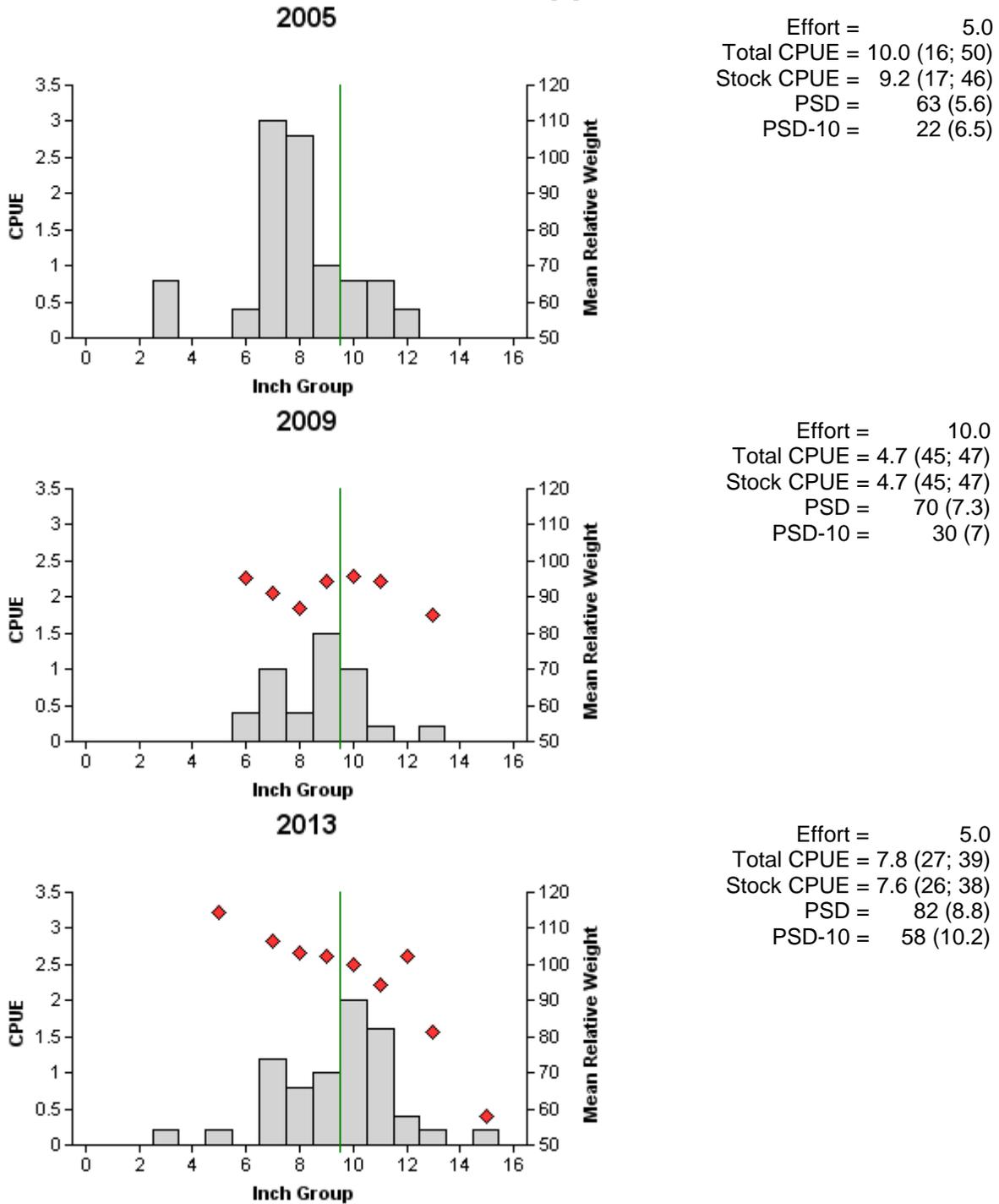
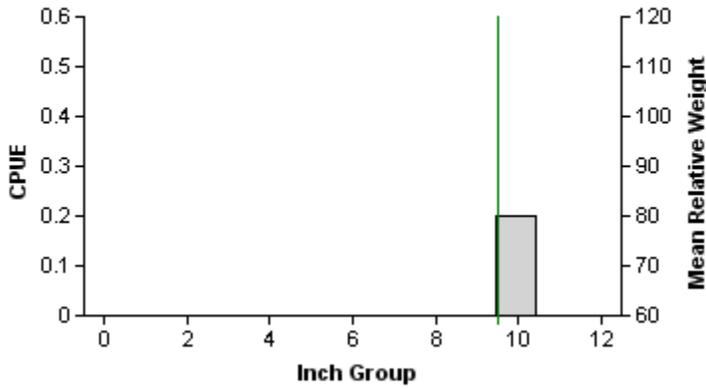


Figure 15. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Graham Reservoir, Texas, 2005, 2009, and 2013.

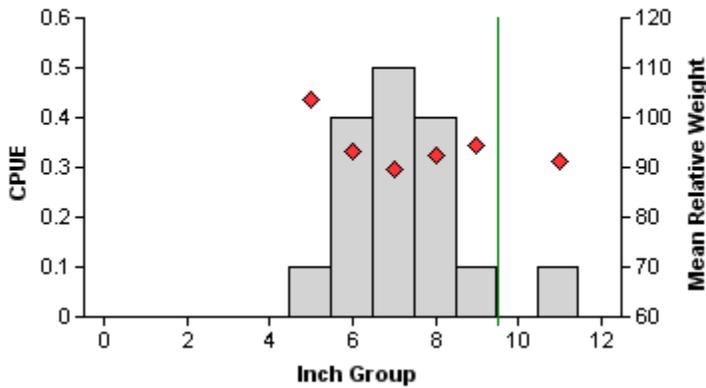
Black Crappie

2005



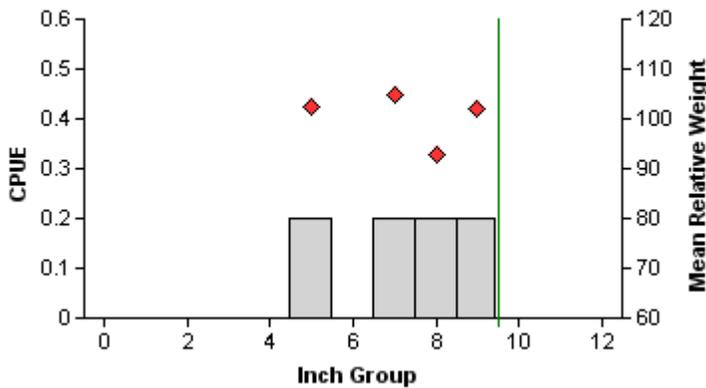
Effort = 5.0
 Total CPUE = 0.2 (100; 1)
 Stock CPUE = 0.2 (100; 1)
 PSD = 100 (0.0)
 PSD-10 = 100 (0)

2009



Effort = 10.0
 Total CPUE = 1.6 (61; 16)
 Stock CPUE = 1.6 (61; 16)
 PSD = 38 (10.1)
 PSD-10 = 6 (2.9)

2013



Effort = 5.0
 Total CPUE = 0.8 (100; 4)
 Stock CPUE = 0.8 (100; 4)
 PSD = 50 (0)
 PSD-10 = 0 (0)

Figure 16. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Graham Reservoir, Texas, 2005, 2009, and 2013.

Crappie

Table 13. Creel survey statistics for crappie at Graham Reservoir from June 2008 through May 2009 and June 2013 through May 2014. Total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses. Acreage during the 2013/2014 creel survey was 1,722.4.

Creel survey statistic	Year	
	2008/2009	2013/2014
Directed effort (h)	21,542.5	19,715.2
Directed effort/acre	9.0	11.4
Total catch per hour	6.9	4.8
Total harvest	20,906.3	22,249.0
Harvest/acre	8.7	12.9
Percent legal released	6.0	2.0

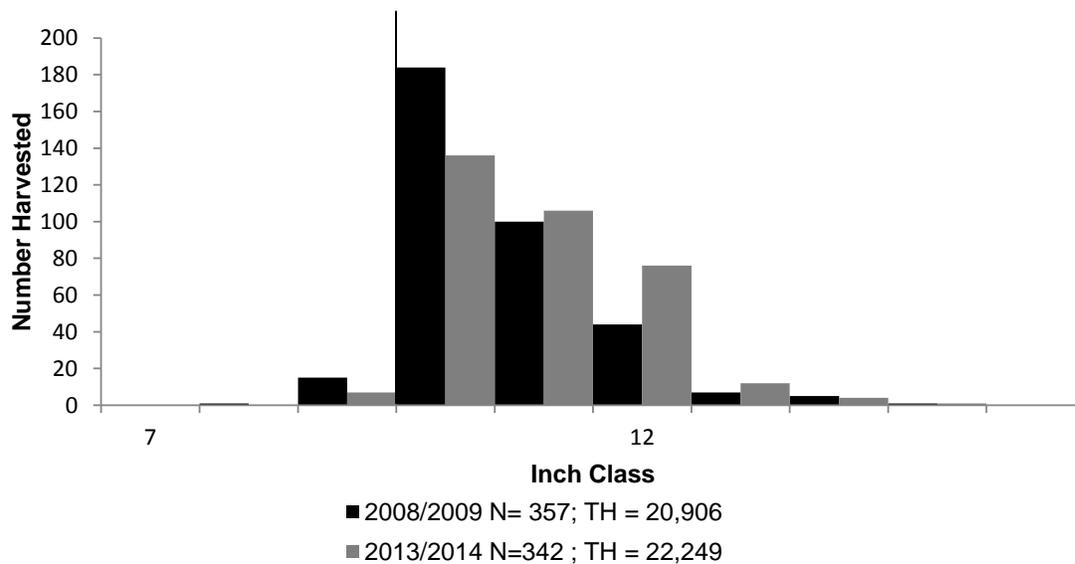


Figure 17. Length frequency of harvested crappie observed during creel surveys at Graham Reservoir, Texas, June 2008 through May 2009 and June 2013 through May 2014, all anglers combined. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 14. Proposed sampling schedule for Graham Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

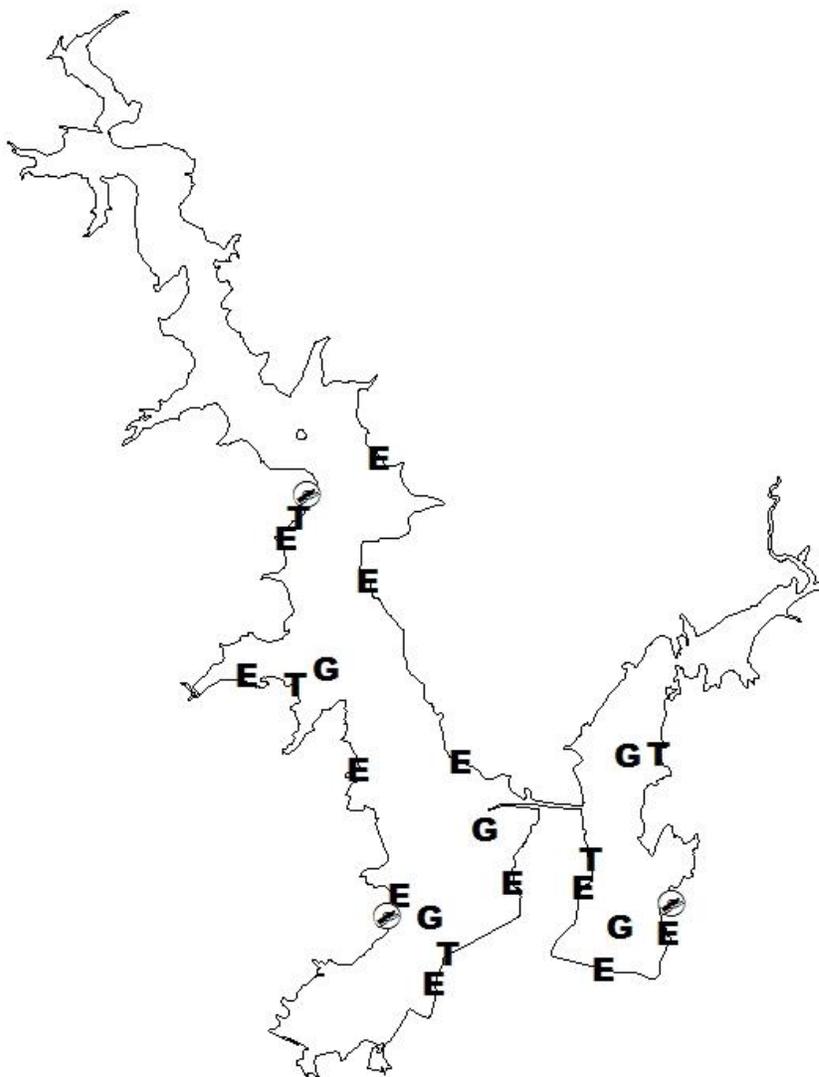
Survey year	Electrofishing Fall(Spring)	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2014-2015								
2015-2016	A		A					
2016-2017								
2017-2018	S	S	S		S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Graham Reservoir, Texas, 2013-2014. Sampling effort was 5 net nights for gill netting, 5 net nights for trap netting, and 1 hour for electrofishing.

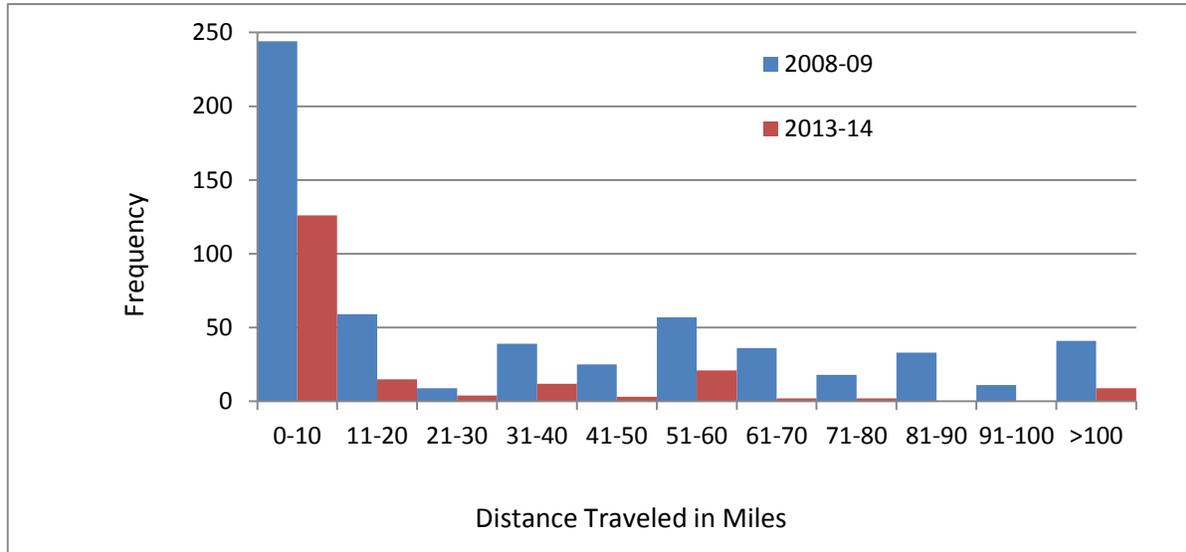
Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Longnose Gar	5	1.0				
Gizzard Shad	43	8.6			220	220.0
Threadfin Shad					274	274.0
Smallmouth Buffalo	4	0.8				
Blue Catfish	44	8.8				
Channel Catfish	8	1.6				
White Bass	51	10.2				
Palmetto Bass	10	2.0				
Warmouth					2	2.0
Bluegill			24	4.8	35	35.0
Longear Sunfish			8	1.6	19	19.0
Redear Sunfish			8	1.6	35	35.0
Largemouth Bass					101	101.0
White Crappie	8	1.6	39	7.8		
Black Crappie	2	0.4	4	0.8		
Freshwater Drum	5	1.0				

APPENDIX B



Location of sampling sites, Graham Reservoir, Texas, 2013-2014. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.

APPENDIX C



Distance traveled in miles to fish Lake Graham determined by zip codes collected during year-long creel surveys conducted June 1 through May 31, 2008-09 and 2013-14.