PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

Aquilla Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Aquilla Reservoir were surveyed in 2006 using electrofishing and trap nets and in 2007 using gill nets. Anglers were surveyed from September to December 2006 and March to May 2007 with a creel. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Aquilla Reservoir is a 2,366-acre impoundment located in Hill County, approximately 10 miles east of Whitney, Texas. The reservoir was created in 1982 by the United States Army Corps of Engineers for municipal water supply and flood control. Water levels began to drop in late spring 2005, and continued dropping until early spring 2007 when the lake refilled. Aquilla Reservoir is moderately productive, with turbidity ranging from 2 to 4 feet. Fish habitat at time of sampling consisted primarily of standing timber and stumps, as well as featureless bank. Vegetation was non-existent because of low water levels.

- **Management history:** Important sport fish include white bass, largemouth bass, white crappie, and catfish. The management plan from the 2002 survey report included monitoring hydrilla, promoting the blue catfish fishery, and conducting a year-long creel to determine angler attitudes about the 18" minimum length limit for largemouth bass and measure utilization of the crappie and catfish populations. The planned year-long creel survey was shortened to creels during fall 2006 and spring 2007 because these periods of relatively high-use gave us all the information needed to manage the reservoir.

- **Fish Community**
  - **Prey species:** Threadfin shad continue their strong presence in the reservoir. Electrofishing catch of gizzard shad was very high, with most available as forage. Electrofishing catch of bluegills was satisfactory, with most also available as forage.

  - **Catfishes:** The channel catfish and blue catfish gill net catch rates were satisfactory, with plenty of fish available to anglers. Although flathead catfish are present in the reservoir, none were collected.

  - **White bass:** White bass were collected at a high rate in spring 2007 gill net samples, and all of them exceeded the minimum legal length. This was the best sample seen in the last decade.

  - **Largemouth bass:** Largemouth bass were collected at a rate similar to previous years. Population size structure was good.

  - **White crappie:** Abundance, size, and body condition of white crappie continued to be good, although total catch rate declined the past three samples. However the proportion of legal-sized fish increased.

- **Management Strategies:** Conduct general monitoring with trap nets, gill nets, and electrofishing surveys in 2010-2011. Survey exotic aquatic vegetation annually during the next 4 years.

INTRODUCTION

This document is a summary of fisheries data collected from Aquilla Reservoir in 2006-2007. 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 is presented with the 2006-2007 data for comparison.

Reservoir Description

Aquilla Reservoir is a 2,366-acre reservoir located in Hill County, Texas. The reservoir was constructed in 1982 by the United States Army Corps of Engineers to serve as a source of municipal water and for flood control. Conservation pool is 537.5' above mean sea level. The reservoir has a maximum depth of 59.5 feet and an average depth of 16 feet. The reservoir is in the Blackland Prairie Ecological Area; land use around the reservoir is primarily agricultural. Water levels began to drop in late spring 2005, and continued dropping until early spring 2007 when the lake refilled (Figure 1). Aquilla is moderately productive, with water clarity ranging from 2 to 4 feet. Fish habitat at time of sampling consisted of standing timber, rocky shoreline, and sand flats. Vegetation was non-existent because of low water levels. There are two improved and one un-improved public boat ramps, so boat access is good. Bank access is adequate, with most anglers fishing along the shore near the Dairy Hill Boat Ramp. However facilities allowing easy access to the waters edge are limited. Currently, there are no handicap-specific facilities. Further information about Aquilla Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Web page at www.tpwd.state.tx.us and navigating within the fishing link.

Management History

Previous management strategies and actions: Many district 2B management philosophies have changed since the 2003 Aquilla Reservoir Survey Report was written (Tibbs and Baird 2003). Because of this, some management actions were not carried through as planned. Instead, additional sampling effort has been allocated to single reservoirs within the district each year and their associated tier IV sampling protocols. Management strategies and actions (where appropriate) from the previous survey report included:

1. Monitor genetic composition of largemouth bass population every two years.
   Action: Genetic composition was not evaluated in 2004. Genetic composition was evaluated in 2006 as part of the standard sampling protocol and in conjunction with a tier IV age sample.
2. Survey aquatic vegetation annually.
   Action: Surveys have been conducted annually to evaluate the presence and quantity of exotic vegetation.
3. Survey anglers in 2004-2005.
   Action: Anglers were surveyed in 2006-2007 in conjunction with the standard sampling protocol. The survey was limited to the fall and spring quarters.
4. Prepare a news release to publicize the blue catfish fishery.
   Action: Larry Hodge, our staff outdoor writer, was invited to Aquilla to do a jugfishing article. This article highlighted the catfish population in Aquilla and appeared in the Texas Parks and Wildlife magazine.

Harvest regulation history: Sportfishes in Aquilla Reservoir are currently managed with statewide regulations with the exception of largemouth bass (Table 2). An 18" minimum length limit was implemented in 1994 to improve the population size structure. The value of this length limit is debatable, although no public concern has been expressed, even during a recent public meeting about the reservoir.

Stocking history: Aquilla Reservoir has not been stocked since 1985 (Florida largemouth bass). Blue catfish were established in 1983. The complete stocking history is in Table 3.

Vegetation/habitat history:
Arrowhead and American lotus have been observed on Aquilla Reservoir in small amounts during most years. Aquilla Reservoir has had hydrilla present since 2002. That year, trace amounts of hydrilla were discovered at the Dairy Hill boat ramp. In 2003, 2 acres were present, split between the Dairy Hill boat ramp and a small island in the mouth of the cove that contains Old School boat ramp. In 2004, three acres were present at the same locations. In 2005, two acres were observed. None were observed in 2006, likely because of low water levels.

METHODS

Fishes were collected by electrofishing (1.0 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). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Additional information on largemouth bass growth and day vs. night catch rates were collected by day electrofishing (1.0 hour at 12 five-minute stations). Additional information on largemouth bass growth was collected by day electrofishing (5.75 hours at 23 fifteen-minute stations). Additional growth information for white crappie was collected using experimental trap netting as part of a request by the crappie sampling committee.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Ages for largemouth bass and white crappie were determined using otoliths from 10 fish per centimeter group (Teir IV sample). Source for water level data was the United States Geological Survey (USGS) website.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of standing timber and stumps, as well as featureless bank (Table 4). A habitat survey was last conducted in 1998 (Mitchell and Dicenzo, 1998).

Creel: Directed fishing effort by anglers was highest for the catfish family (32.6%), followed by anglers fishing for anything, crappie, and fourth, largemouth bass (Table 5). Total fishing effort for all species at Aquilla Reservoir was 12,302 hours in the Fall 2006 and Spring 2007 quarters, and anglers spent an estimated $46,856 on direct expenditures. Aquilla experiences very low use by anglers, with only 5.2 hours per acre total fishing effort. Release rates of legal-size fish of all species were very low, indicating that most Aquilla anglers do not practice catch and release.

Prey species: Electrofishing catch rates of bluegill and gizzard shad were 107.0/h and 554.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was excellent, with almost 90% of gizzard shad available to existing predators. This is typical for Aquilla gizzard shad. Total CPUE of gizzard shad varies from year to year in Aquilla (Figure 2). Total CPUE of bluegill in 2006 was very similar to 2002 CPUE totals, with all collected fish available to predators. (Figure 3). Threadfin shad were collected at a rate of 91.0/h.

Blue catfish: The gill net catch rate of blue catfish was 2.6/nn in 2007. This was down compared to the 2003 sample, but similar to 1998 (Figure 4). Most fish were above legal-size and in good condition.

Channel catfish: The gill net catch rate of channel catfish was 1.2/nn in 2007. This is the lowest catch rate in the past three samples and possibly indicates a trend toward lower abundance (Figure 5). Directed fishing effort, catch per hour, and total harvest for catfish showed a lightly-used catfish fishery (Table 7). Catfish as a group were a harvest-oriented fish as only 3 percent of the legal-sized fish were released. Observed harvest from during the creel showed good angler compliance. Harvested channel catfish ranged in length from 14 to 21 inches (Figure 6).

White bass: The gill net catch rate of white bass was 6.6/nn in 2007, the highest in the last three sample years (Figure 7). All collected fish were of legal size. Directed fishing effort, catch per hour, and total harvest for white bass indicated extremely low utilization (Table 8). White bass anglers were harvest-oriented as no legal-sized fish were released by anglers interviewed during the creel. Harvested fish were all 12 inches (Figure 8).

Largemouth bass: The electrofishing catch rate of largemouth bass was 95/h in 2007, down from 2003 but similar to the 2000 sample (Figure 9). Body condition in 2006 was good, but appeared lower than previous surveys. Directed fishing effort, catch per hour, and total harvest for largemouth bass was 1,959 h, 0.29 fish/h, and 112 fish, respectively, during the Fall 2006 and Spring 2007 creel (Table 9). Only 10% of legal largemouth bass were released by anglers. Florida largemouth bass influence has varied quite a bit, as Florida alleles have ranged from 42% to 66% and Florida genotypes have ranged from 7 to 25% (Table 10). No trends were apparent. Growth of largemouth bass in Aquilla Reservoir was good (Figure 11, Table 11), with a maximum observed age of 7 years. Modeling of the largemouth bass population was completed using FAST 1.0 (Appendix C) (Slipke and Maceina, 2000). Total mortality was 46.1% and the theoretical maximum size was 30.2”, with a theoretical maximum age of 8.4 years. All of these analyses indicate that the largemouth bass population is in good shape.

White crappie: The trap net catch rate of white crappie was 3.6/nn in 2006, which was lower than the previous two surveys (Figure 12). The PSD was 94 which was much higher than the previous 2 surveys due primarily to a reduction in fish less than 9” in length. Mean relative weight was good. Directed fishing effort, catch per hour, and total harvest for crappie was 2,302 h, 0.68 fish/h, and 1,207 fish, respectively, during the Fall 2006 and Spring 2007 creel (Table 12). Size of harvested white crappie ranged from 10 to 15 inches in total length (Figure 13). Growth of white crappie in Aquilla Reservoir was good (Figure 14, Table 13). Modeling of the white crappie population was completed using FAST 1.0 (Appendix C). Total mortality was 81.6% and the theoretical maximum size was 16.8”, with a theoretical maximum age of 4.3 years. Extremely high mortality coupled with reduced recruitment in 2006 and low water in 2007 indicates that crappie anglers will have poor success during the next two years at least.

Fisheries management plan for Aquilla Reservoir, Texas

Prepared – July 2007.

ISSUE 1: Despite a quality fishery for many species and free access, Aquilla is lightly utilized by anglers. Angler use of the reservoir could be increased many-fold without impacting the experience of the anglers currently using the reservoir.

MANAGEMENT STRATEGY

1. Prepare at least one news release highlighting angling opportunities at Aquilla.

ISSUE 2: The most recent habitat survey on file for Aquilla reservoir is dated 1998. Because of low water conditions during the survey period, habitat conditions were poor.

MANAGEMENT STRATEGY

1. Conduct and map a thorough habitat/vegetation survey prior to 2011.

ISSUE 3: The white crappie population appears to be declining. Recent low water events, low recruitment, and high mortality will not help.

MANAGEMENT STRATEGY

1. Evaluate white crappie populations during winter, 2008 trap netting and again in winter, 2010.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule does not include any additional sampling beyond that required by the 4-year rotation. Significant additional effort was expended during 2006/2007 to obtain a more complete view of the fishery in the reservoir. All species are lightly utilized by anglers and few problems were observed. The possible short-term problem with the white crappie population cannot be solved with the tools available.

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Slipke, J. W., and M. J. Maceina. 2000. Fishery analysis and simulation tools (FAST 1.0). Department of Fisheries and Allied Aquacultures. Auburn University, AL

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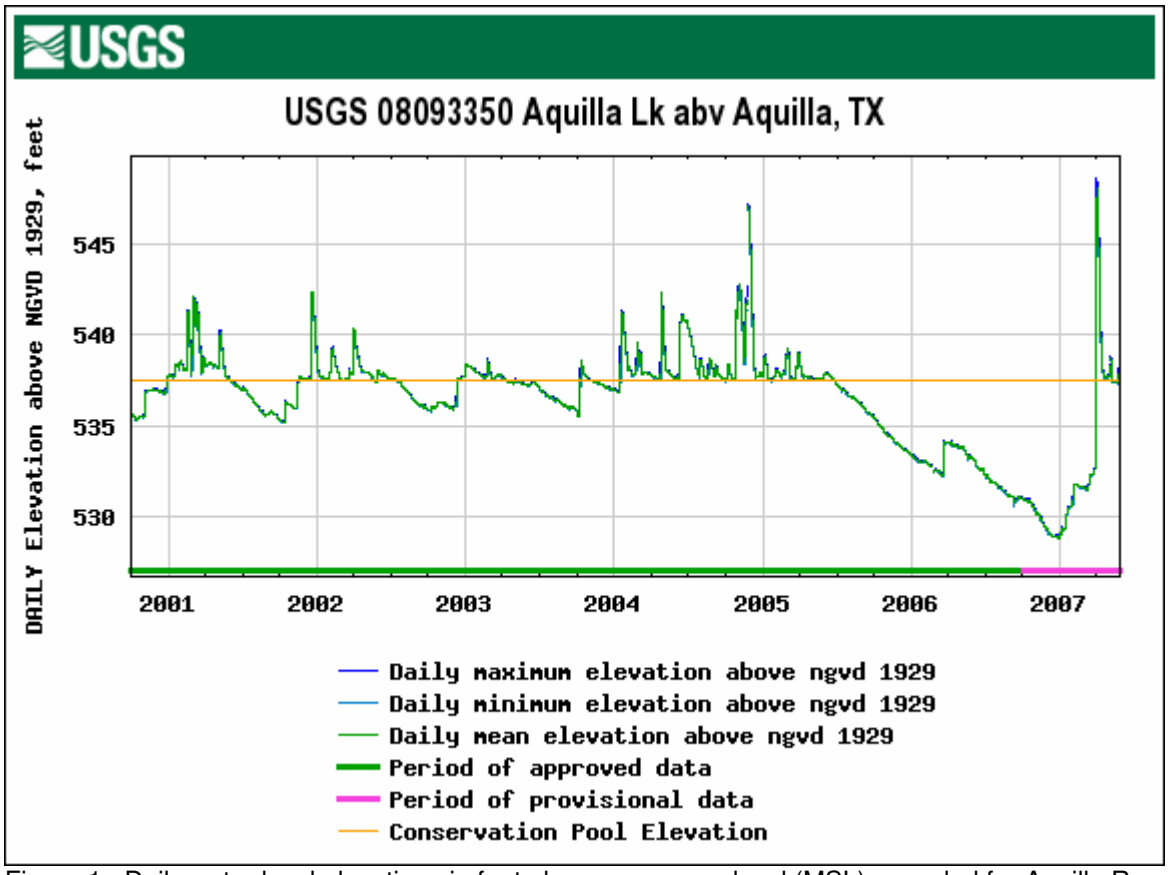


Figure 1. Daily water level elevations in feet above mean sea level (MSL) recorded for Aquilla Reservoir, Texas. From USGS Real-Time Water Data for Texas http://waterdata.usgs.gov/tx/nwis/uv?

Table 1. Characteristics of Aquilla Reservoir, Texas.

Characteristic	Description
Year Constructed	1982
Controlling authority	United States Army Corps of Engineers
County	Hill
Reservoir type	Tributary

Table 2. Harvest regulations for Aquilla Reservoir.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No Limit
Catfish, flathead	5	18 - No Limit
Bass, white	25	10 - No Limit
Bass: largemouth	5	18 – No Limit
Crappie: white	25 (in any combination)	10 - No Limit

Table 3. Stocking history of Aquilla, 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)
Blue catfish	1983	33,261	UNK	UNK
	Total	33,261		
Coppernose bluegill	1984	165,000	AFGL	2.0
	Total	165,000		
Florida Largemouth bass	1982	31,900	FGL	2.0
	1983	164,000	FRY	1.0
	1984	164,753	FGL	2.0
	1985	72,559	FRY	1.0
	Total	433,212		

Table 4. Survey of littoral zone and physical habitat types, Aquilla Reservoir, Texas, 1998. A linear shoreline distance (miles) was recorded for each habitat type found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Eroded bank	4.0	10.0		
Overhanging brush	4.0	10.0		
Dead trees/stumps	19.0	47.5		
Rock bluff	1.0	2.5		
Riprap	1.0	2.5		
Rocky or gravel	1.0	2.5		
Featureless	10.0	< 1.0		

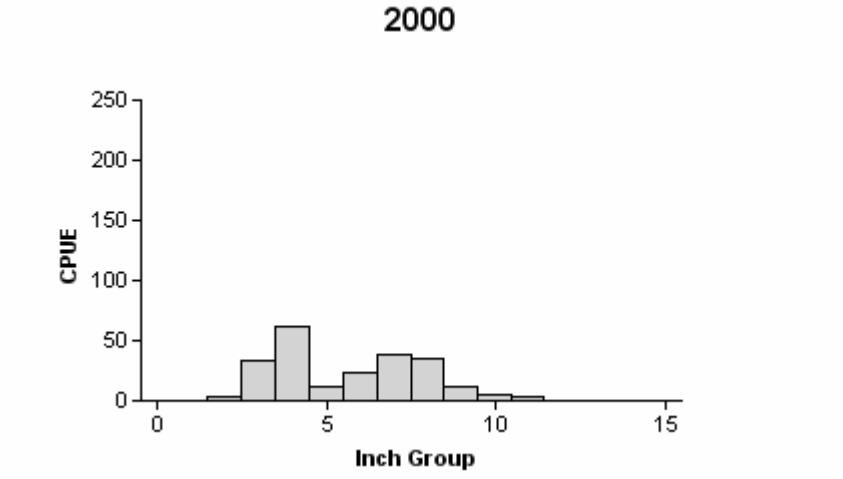
Table 5. Percent directed angler effort by species for Aquilla Reservoir, Texas, 2006-2007.

Species	Percent
Catfish spp.	32.6
White bass	1.6
Largemouth bass	15.9
Crappie spp.	18.7
Anything	31.2

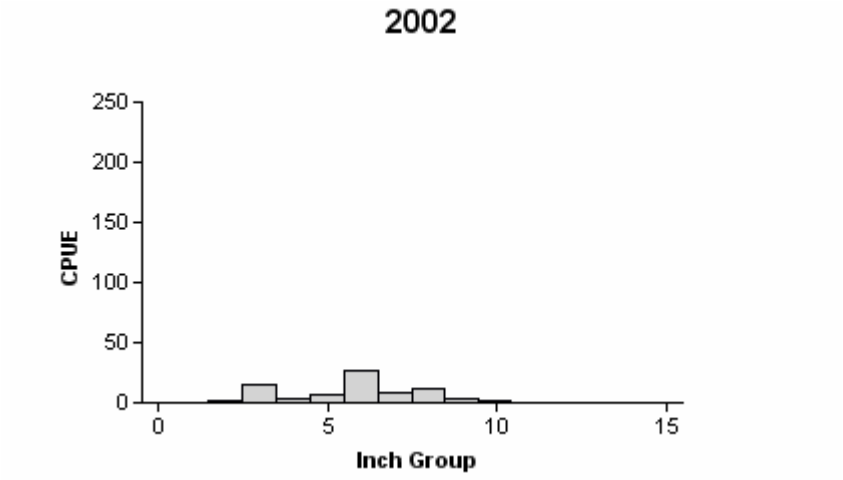
Table 6. Total fishing effort (h) for all species and total directed expenditures at Aquilla Reservoir, Texas, 2006-2007.

Creel Statistic	2006/2007
Total fishing effort (hours)	12,302
Total directed expenditures	$46,856

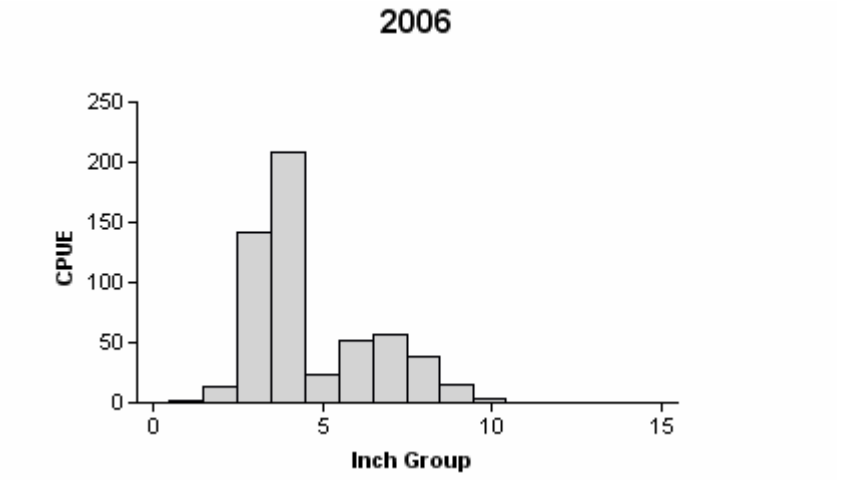
Gizzard Shad



Effort = 1.0
Total CPUE = 227.0 (14; 227)
IOV = 76.21 (8)



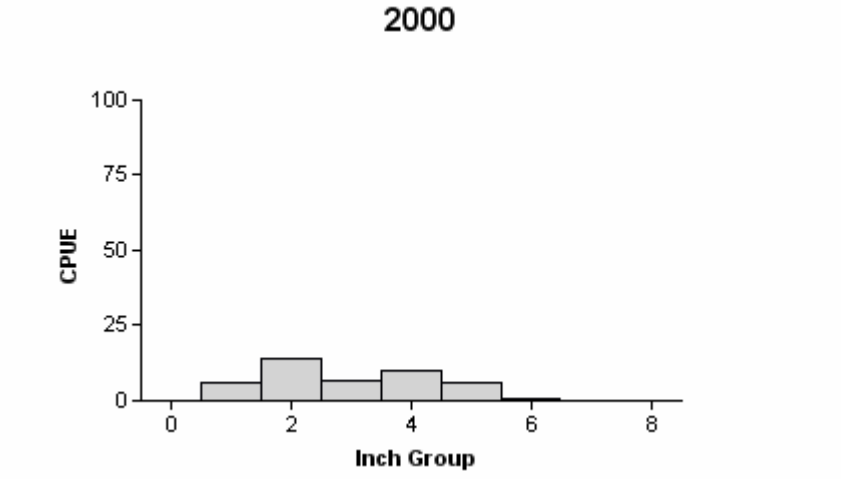
Effort = 1.0
Total CPUE = 77.0 (30; 77)
IOV = 79.22 (5.6)



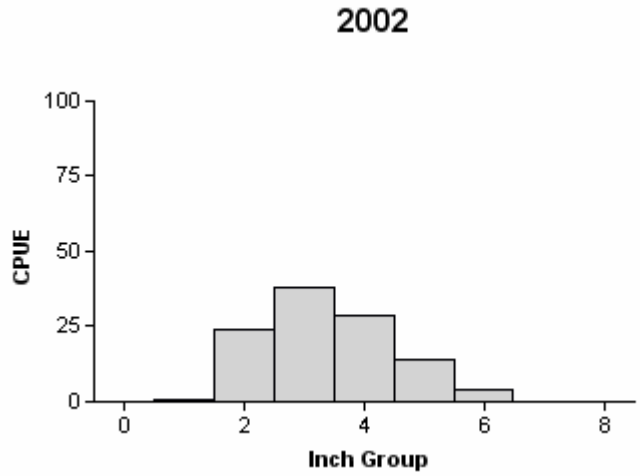
Effort = 1.0
Total CPUE = 554.0 (23; 554)
IOV = 89.71 (3.9)

Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices for fall electrofishing surveys.

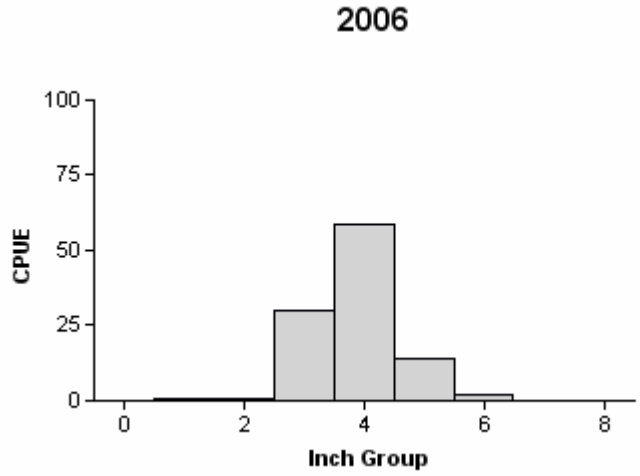
Bluegill



Effort = 1.0
Total CPUE = 44.0 (43; 44)
Stock CPUE = 24.0 (54; 24)
PSD = 4 (2.3)



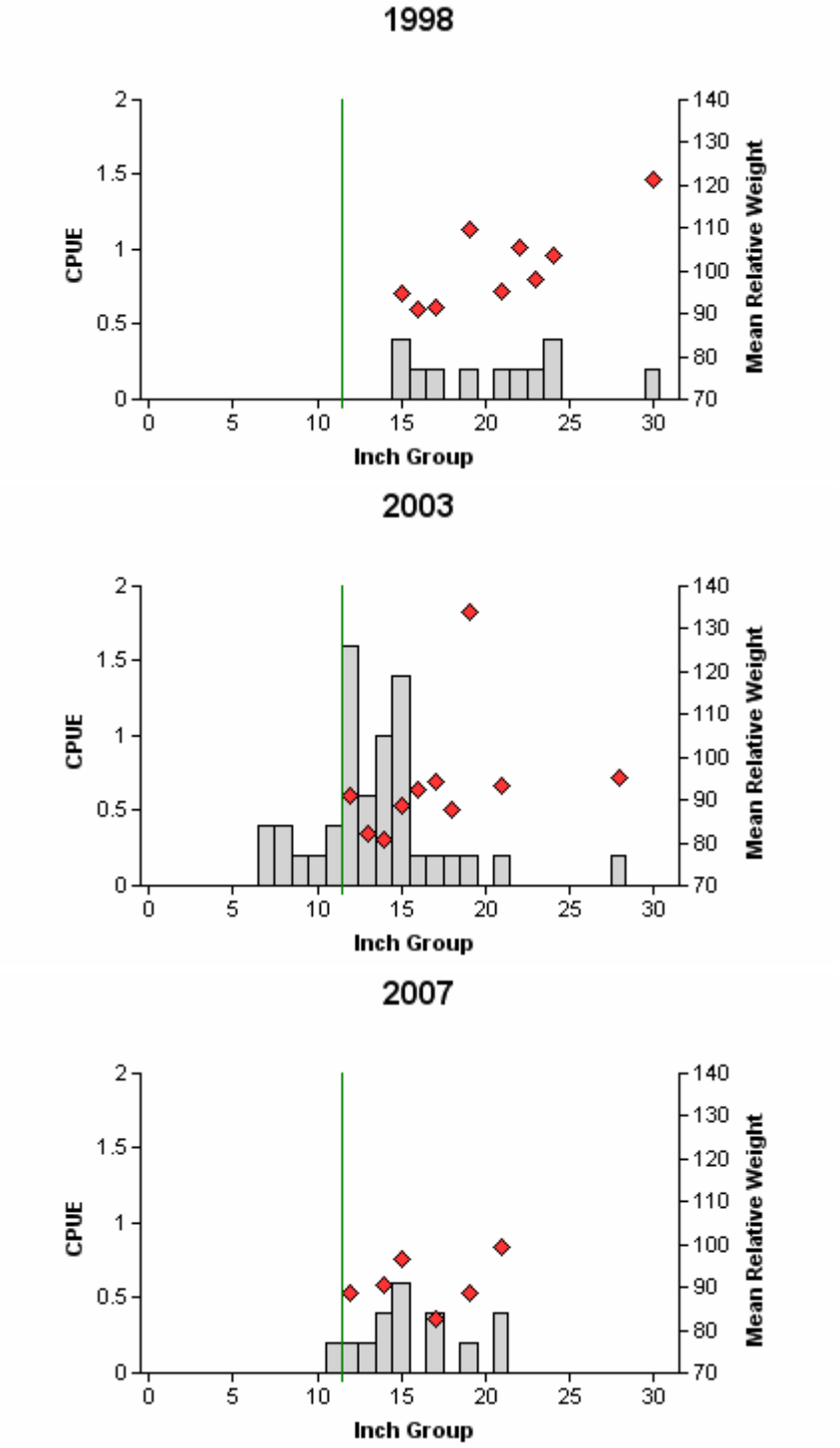
Effort = 1.0
Total CPUE = 110.0 (52; 110)
Stock CPUE = 85.0 (49; 85)
PSD = 5 (3.3)



Effort = 1.0
Total CPUE = 107.0 (19; 107)
Stock CPUE = 105.0 (19; 105)
PSD = 2 (1.1)

Figure 3. Number of bluegill caught per hour (CPUE) and population indices for fall electrofishing surveys.

Blue Catfish



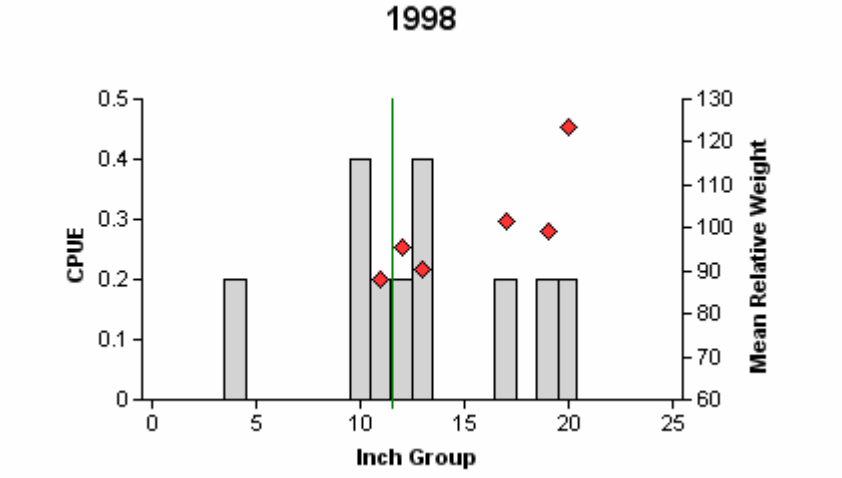
Effort = 5.0
Total CPUE = 2.2 (17; 11)
Stock CPUE = 2.2 (17; 11)
PSD = 55 (18.9)
RSD-P = 9 (8.4)

Effort = 5.0
Total CPUE = 7.4 (39; 37)
Stock CPUE = 5.8 (41; 29)
PSD = 7 (6.3)
RSD-P = 0 (0)

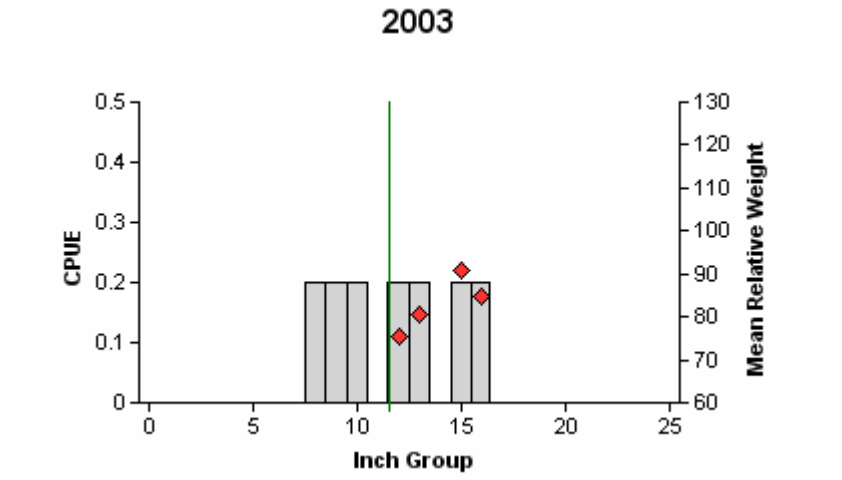
Effort = 5.0
Total CPUE = 2.6 (31; 13)
Stock CPUE = 2.4 (28; 12)
PSD = 17 (5.7)
RSD-P = 0 (0)

Figure 4. Number of blue catfish caught per net night (CPUE) and population indices for spring gill net surveys.

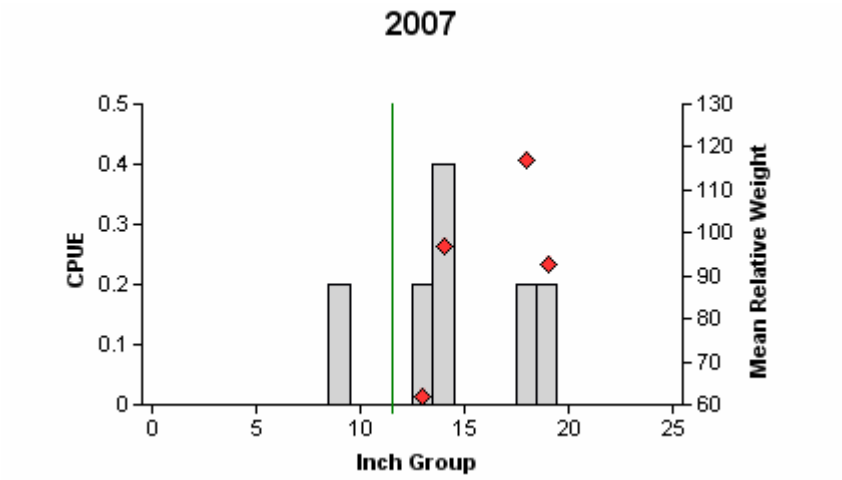
Channel Catfish



Effort =	5.0
Total CPUE =	2.0 (35; 10)
Stock CPUE =	1.4 (43; 7)
PSD =	43 (18)
RSD-P =	0 (0)
RSD-12 =	86 (14)



Effort =	5.0
Total CPUE =	1.4 (36; 7)
Stock CPUE =	0.8 (25; 4)
PSD =	25 (24.2)
RSD-P =	0 (0)
RSD-12 =	100 (0)



Effort =	5.0
Total CPUE =	1.2 (49; 6)
Stock CPUE =	1.0 (63; 5)
PSD =	40 (6.3)
RSD-P =	0 (0)
RSD-12 =	100 (0)

Figure 5. Number of channel catfish caught per net night (CPUE) and population indices for spring gill net surveys.

Catfish spp.

Table 7. Creel survey statistics for catfish spp. at Aquilla Reservoir for Fall 2006 and Spring 2007 quarters, where total catch per hour is for anglers targeting catfish spp. and total harvest is the estimated number of catfish spp. harvested by all anglers. Relative standard errors (RSE) are in parentheses

Directed effort (h)	4013.00 (31)
Directed effort/acre	1.70 (31)
Total catch per hour	0.40 (78)
Total harvest	439.00
Harvest/acre	0.19

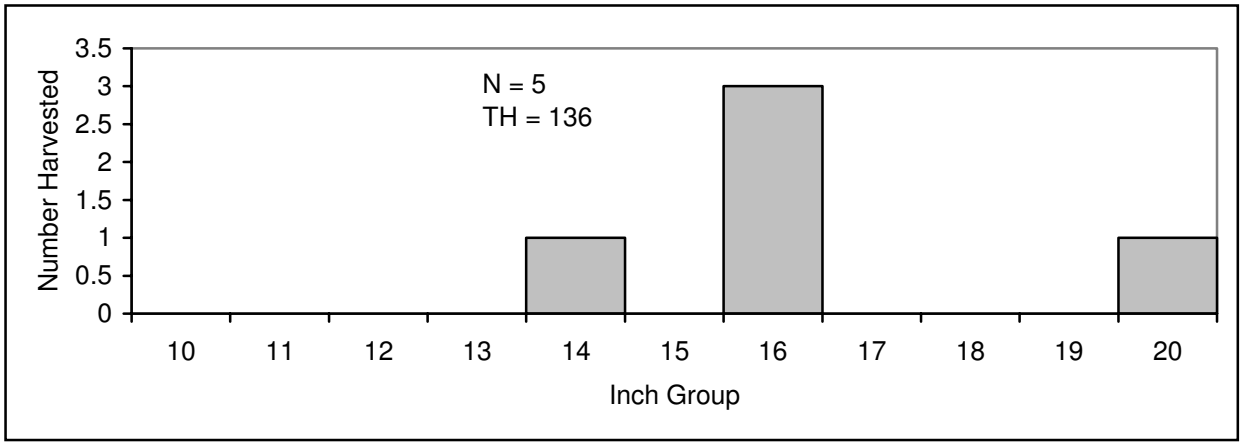
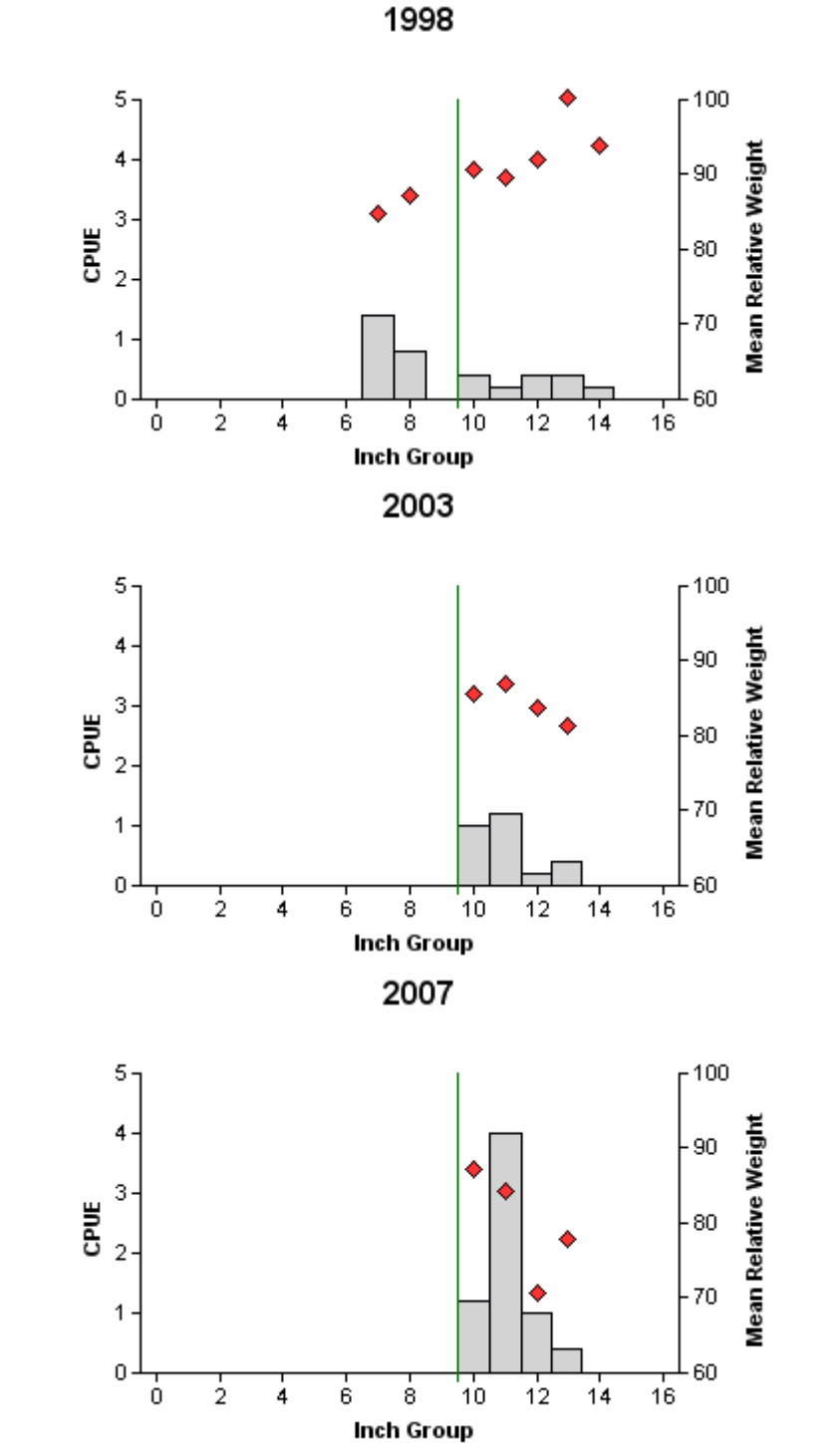


Figure 6. Length frequency of harvested channel catfish observed during creel surveys at Aquilla Reservoir, Texas, fall 2006 and spring 2007 quarters, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass



1998

Effort = 5.0
Total CPUE = 3.8 (51; 19)
Stock CPUE = 3.8 (51; 19)
PSD = 42 (19.6)
RSD-P = 26 (16)
RSD-10 = 42 (19.6)

2003

Effort = 5.0
Total CPUE = 2.8 (17; 14)
Stock CPUE = 2.8 (17; 14)
PSD = 100 (0.0)
RSD-P = 21 (10)
RSD-10 = 100 (0)

2007

Effort = 5.0
Total CPUE = 6.6 (17; 33)
Stock CPUE = 6.6 (17; 33)
PSD = 100 (0)
RSD-P = 21 (5.5)
RSD-10 = 100 (0)

Figure 7. Number of white bass caught per net night (CPUE) and population indices for spring gill net surveys.

White Bass

Table 8. Creel survey statistics for white bass at Aquilla Reservoir for Fall 2006 and Spring 2007 quarters, where 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

Directed effort (h)	193.00 (84)
Directed effort/acre	0.08 (84)
Total catch per hour	0.92 (64)
Total harvest	112.00 (232)
Harvest/acre	0.05 (232)

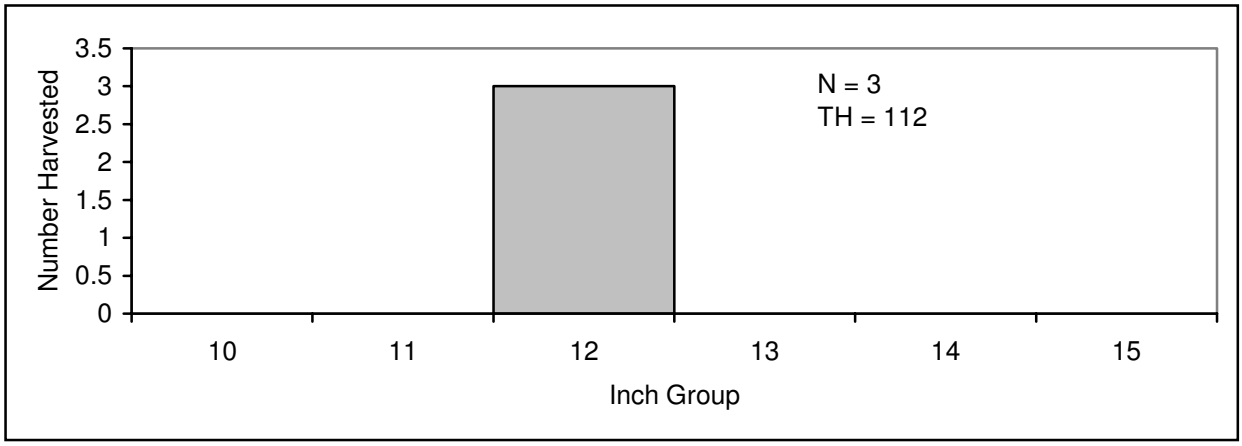
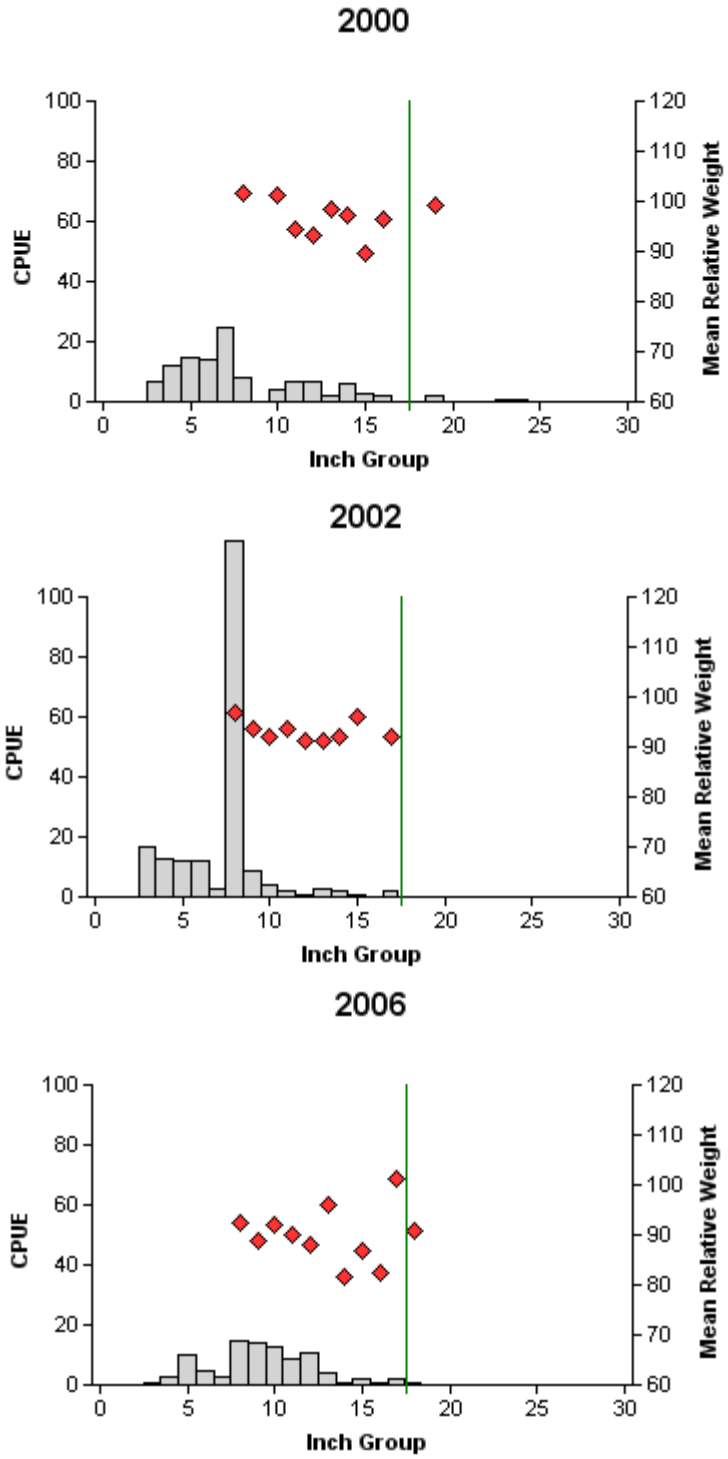


Figure 8. Length frequency of harvested white bass observed during creel surveys at Aquilla Reservoir, Texas, fall 2006 and spring 2007 quarters, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass



Effort =	1.0
Total CPUE =	116.0 (23; 116)
Stock CPUE =	43.0 (19; 43)
PSD =	56 (6.9)
RSD-P =	21 (7.8)
RSD-14 =	35 (8.5)

Effort =	1.0
Total CPUE =	200.0 (59; 200)
Stock CPUE =	143.0 (82; 143)
PSD =	6 (4.8)
RSD-P =	2 (2.4)
RSD-14 =	3 (2.5)

Effort =	1.0
Total CPUE =	95.0 (32; 95)
Stock CPUE =	73.0 (31; 73)
PSD =	30 (6)
RSD-P =	8 (2.8)
RSD-14 =	10 (2.5)

Figure 9. Number of largemouth bass caught per hour (CPUE) and population indices for fall electrofishing surveys.

Largemouth Bass

Table 9. Creel survey statistics for largemouth bass at Aquilla Reservoir for Fall 2006 and Spring 2007 quarters, where 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.

Directed effort (h)	1959.00 (30)
Directed effort/acre	0.83 (30)
Total catch per hour	0.29 (83)
Total harvest	112.00 (6)
Harvest/acre	0.05 (6)

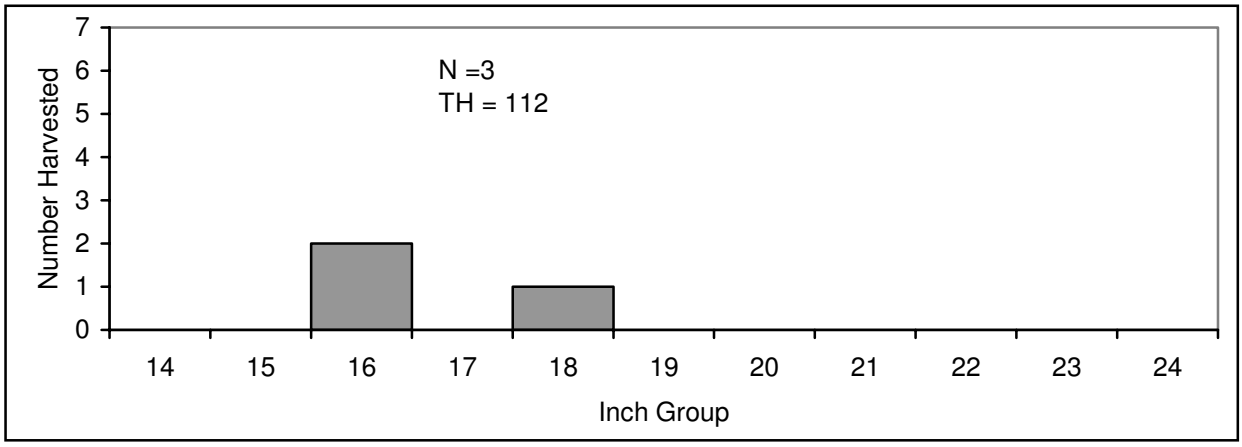


Figure 10. Length frequency of harvested largemouth bass observed during creel surveys at Aquilla Reservoir, Texas, for fall 2006 and spring 2007 quarters, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 10. Results of genetic analysis of largemouth bass collected by fall electrofishing, Aquilla Reservoir, Texas, 2000, 2002, and 2006. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Hybrid = bass with both FLMB and NLMB alleles.

		Genotype				
Year	Sample size	%FLMB	%Hybrid	%NLMB	% FLMB alleles	% Northern alleles
2000	30	25	71	4	66	44
2002	30	3	80	17	42	58
2006	30	7	93	0	59	41

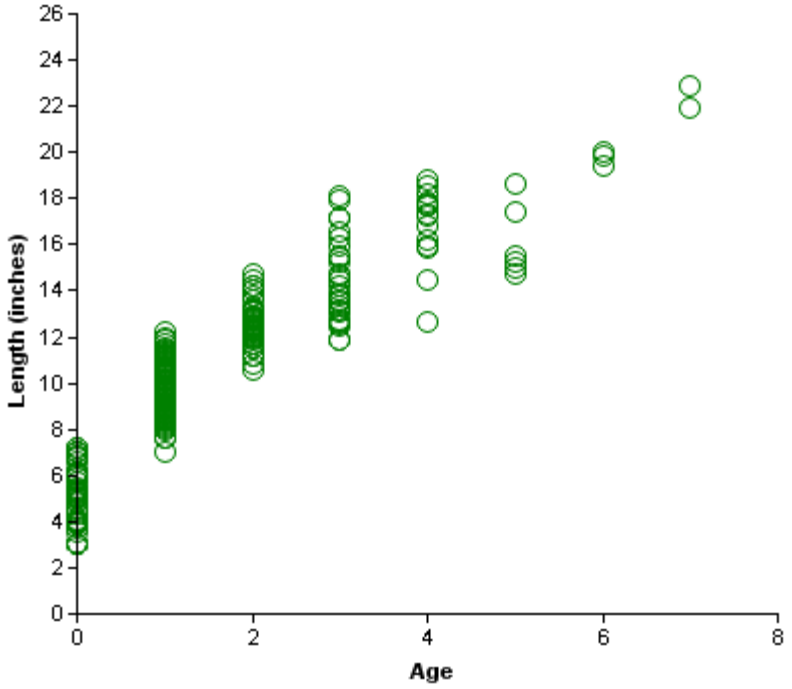


Figure 11. Length at age for largemouth bass collected by electrofishing at Aquilla Reservoir, Texas, Fall, 2006.

Table 11: Average length at capture for largemouth bass (sexes combined) ages 0 – 7 collected in electrofishing surveys, Aquilla Reservoir, fall 2006. Lengths are followed by the sample size. Note that the age-0 data may not be representative of the actual size distribution because of gear bias against smaller fish.

	Growth	
Age	Total Length	Number of fish
0	5.02	90
1	9.78	88
2	12.60	45
3	14.46	28
4	16.86	15
5	16.10	6
6	19.75	3
7	22.44	2

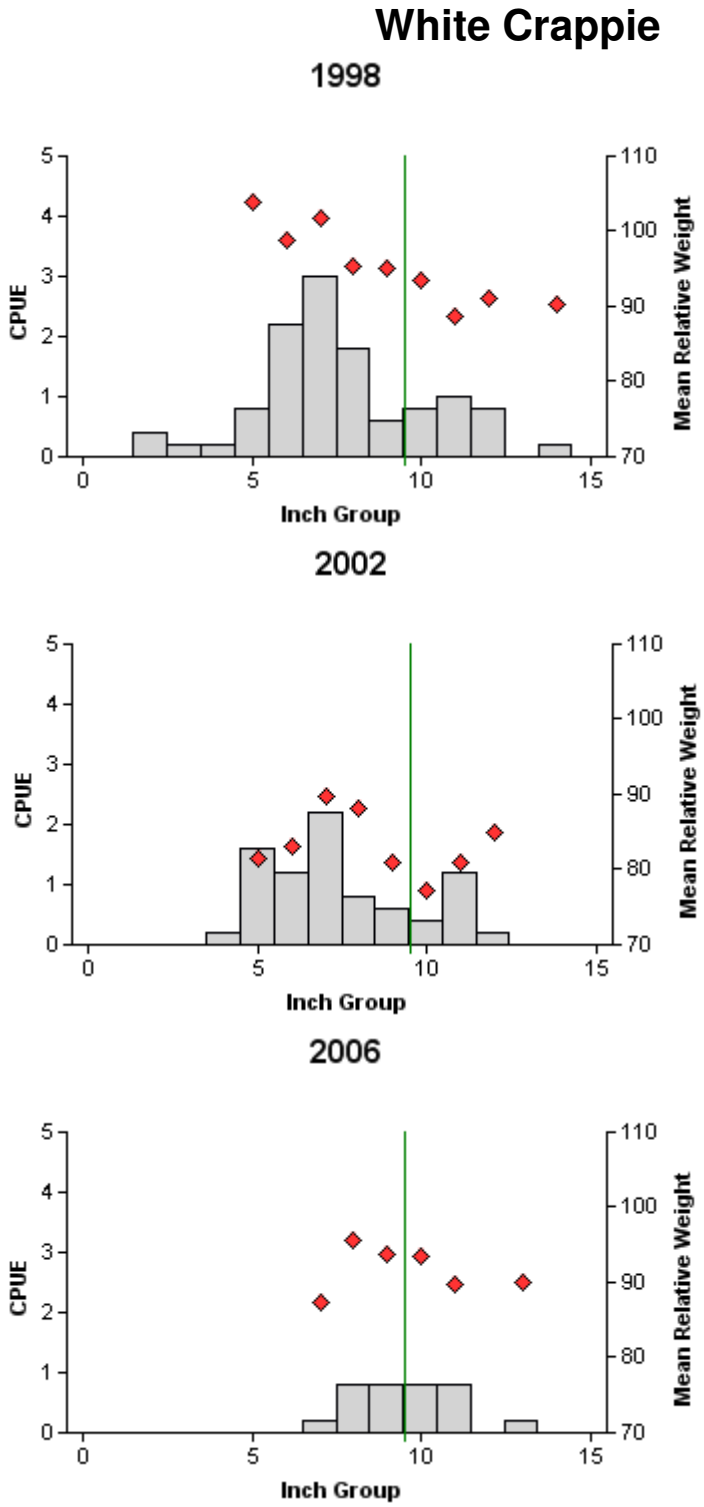


Figure 12. Number of white crappie caught per net night (CPUE) and population indices for winter trap net surveys.

White Crappie

Table 12. Creel survey statistics for white crappie at Aquilla Reservoir for Fall 2006 and Spring 2007 quarters where total catch per hour is for anglers targeting white crappie and total harvest is the estimated number of white crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Directed effort (h)	2,302.00 (32)
Directed effort/acre	0.97 (32)
Total catch per hour	0.68 (46)
Total harvest	1,207.00
Harvest/acre	0.51

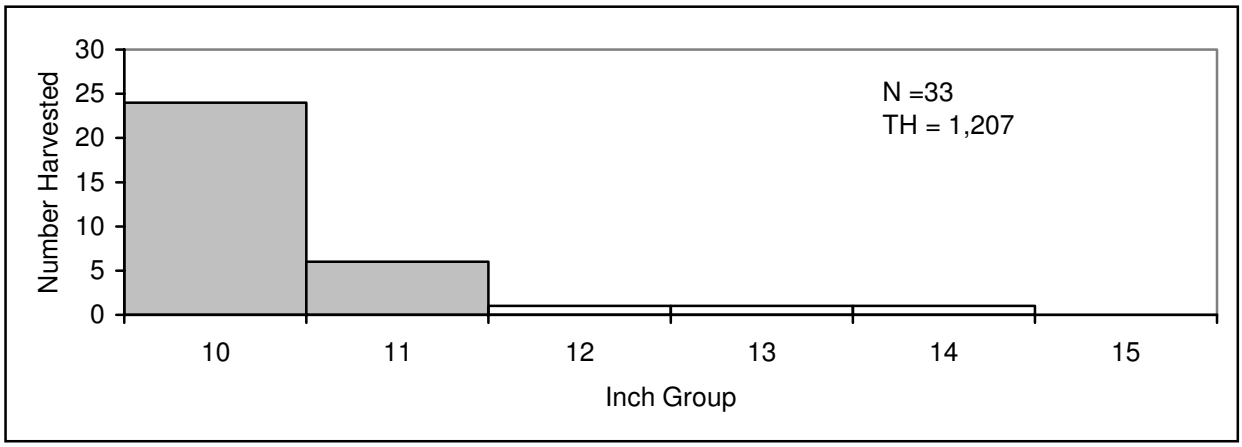


Figure 13. Length frequency of harvested white crappie observed during creel surveys at Aquilla Reservoir, Texas, for fall 2006 and spring 2007 quarters, all anglers combined. N is the number of harvested white crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

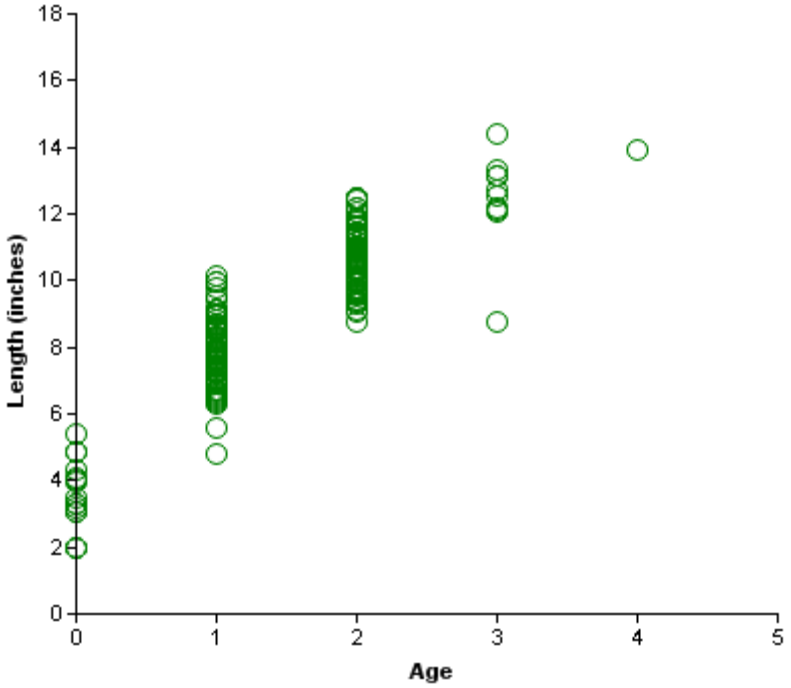


Figure 14. Length at age for white crappie collected from trap nets at Aquilla Reservoir, Texas, 2006.

Table 13: Average length at capture for white crappie (sexes combined) ages 0 – 4 collected in trap netting surveys, Aquilla Reservoir, winter 2006. Lengths are followed by the sample size. Note that the age-0 data may not be representative of the actual size distribution because of possible gear bias against smaller fish.

	Growth	
Age	Total Length	Number of fish
0	3.55	16
1	7.89	74
2	10.73	76
3	12.43	10
4	13.90	1

Table 14. Proposed sampling schedule for Aquilla Reservoir, Texas. 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.

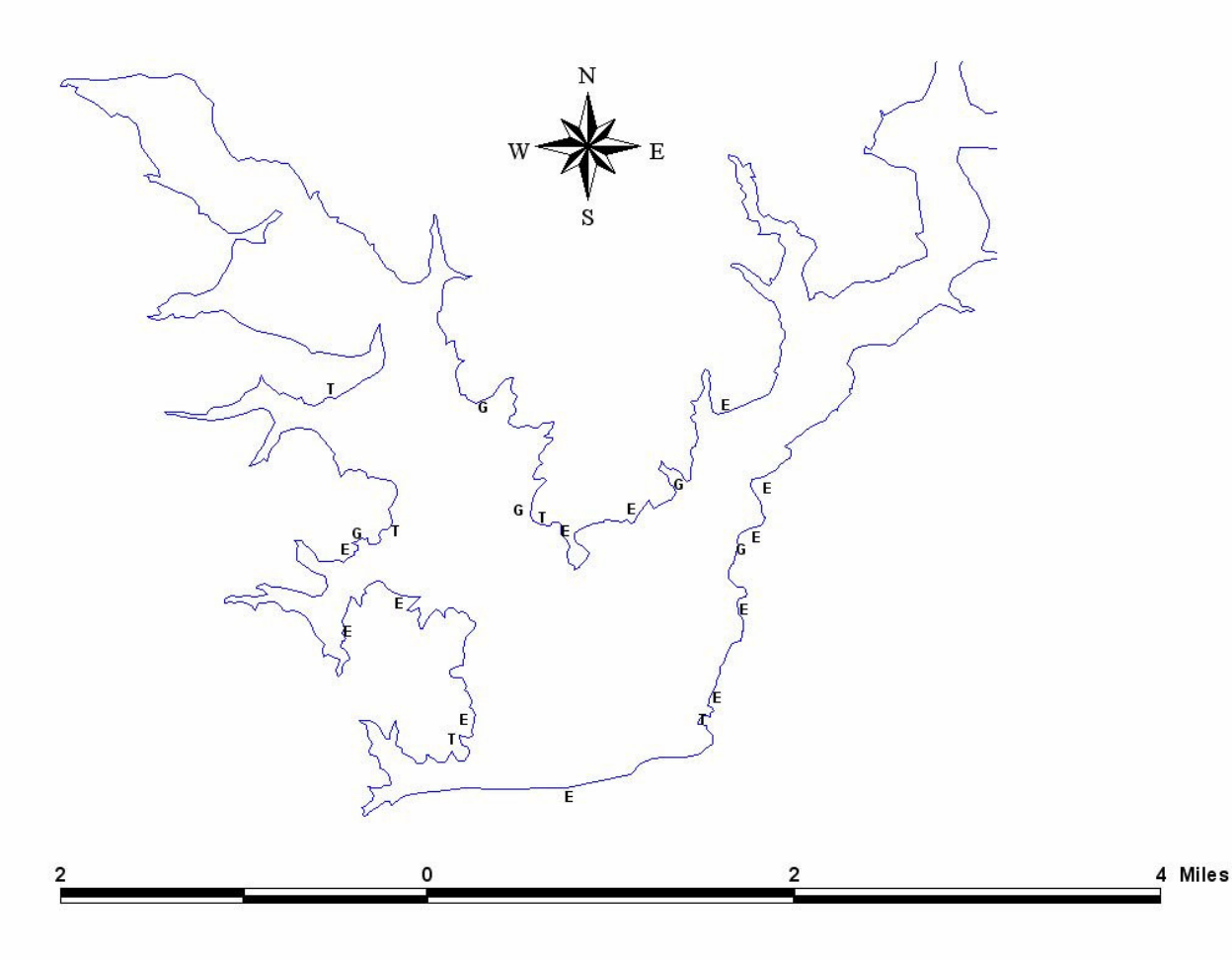
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2007-Spring 2008					
Fall 2008-Spring 2009		A			
Fall 2009-Spring 2010					
Fall 2010-Spring 2011	S	S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Aquilla Reservoir, Texas, 2006-2007.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					554	554.0
Threadfin shad					91	91.0
Blue catfish	13	2.6				
Channel catfish	6	1.2				
White bass	33	6.6				
Green sunfish					6	6.0
Bluegill					107	107.0
Longear sunfish					33	33.0
Redear sunfish					8	8.0
Largemouth bass					95	95.0
White crappie			18	3.6		

APPENDIX B



Location of sampling sites, Aquilla Reservoir, Texas, 2006-2007. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.

Appendix C: Results from FAST modeling

Introduction

Recruitment, growth, exploitation, total mortality, and maximum size are all important population statistics to have when managing a reservoir. We calculated these statistics from data collected during management surveys using Fishery Analysis and Simulation Tools (FAST) (Slipke and Maceina, 2000).

Methods

Largemouth bass and white crappie otoliths were collected using a stratified random approach in which ten fish per centimeter group were selected for otolith extraction. The remaining fish were assigned ages using a length-age key. Collection and processing of otoliths was conducted according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 2005).

Total annual mortality, theoretical maximum age, L-infinity (theoretical maximum length), and residuals (year class strength) were calculated using FAST. Unweighted catch-curve regression was used to examine annual mortality, theoretical maximum age, and year class strength. The Von Bertalanffy growth function was used to determine L-infinity. Data from age-1 through age-4 were used to calculate total annual mortality, theoretical maximum age, and year class strength for white crappie, because it appeared that age-0 fish were underrepresented in the sample (Table 13), possibly due to escapement from the trap nets. Only data from age-0 through age-3 were used for largemouth bass to calculate total annual mortality, theoretical maximum age, and year class strength, because of possible gear bias for older fish described in the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 2005). Theoretical maximum length was calculated using length data from all ages, as length-at-age is less affected by gear bias than other variables. Not including all data results in a very different and much lower estimate of theoretical maximum length. Fish were not segregated by sex during the analysis.

Creel data were collected according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 2003). Estimates of exploitation were determined from this information.

Results and Discussion

The results are shown in the accompanying table. The largemouth bass population exhibits moderate total mortality, almost non-existent exploitation, an excellent theoretical maximum length of 30.2”, a maximum age of 8.4 years, and variable recruitment. The white crappie population exhibits very high total mortality, low exploitation, a reasonable maximum length of 16.8”, a maximum age of only 4.3 years, and variable recruitment.

It is clear that with such low exploitation, additional harvest restrictions will do little to restructure any of these populations at the current time. The mortality observed appears to be primarily natural mortality. However, if angling pressure were to increase in the future, it is possible that exploitation might become a factor, necessitating additional harvest restrictions.

Population parameters of sport fishes in Aquilla Reservoir, 2006-2007. Estimates were obtained using the Fast Modeling Program.

Species	N aged	Total Mortality	Exploitation rate	Maximum size (L-infinity)	Maximum age	Residuals
Largemouth bass	401	46.1%	0.05/acre	30.2”	8.4	-.337 to 0.201
White crappie	251	81.6%	0.47/acre	16.8”	4.3	-.519 to 0.730

Appendix D: Results from night vs. day electrofishing

Introduction

The current standardized electrofishing procedures require that sampling be conducted at night no earlier than 30 minutes after sunset (unpublished, revised manual 2005). The reasons traditionally cited for this include increased fish activity in shallow water at night, decreased avoidance of the electrofishing boat, and the ability to sample larger fish. We tested whether these assumptions affected catch rates of largemouth bass in Aquilla Reservoir during fall 2006 electrofishing.

Methods

A total of 24 five-minute stations were randomly selected throughout the lake for the day vs. night electrofishing comparison, 12 for each treatment. All samples were collected on 9/26/06. During night electrofishing, all target species were collected. During day electrofishing, only largemouth bass were collected. Water clarity ranged from 50 to 70 cm, as measured by a secchi disk.

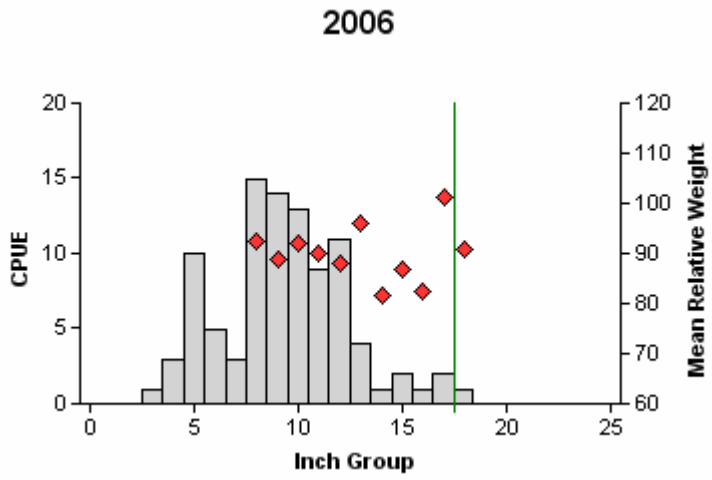
Results and Discussion

The results are shown in the accompanying graphs. The first graph is the standard night electrofishing with the associated population indices. The second graph is the accompanying day electrofishing. The third graph is for reference only, and includes all of the day electrofishing that was completed (6.75 hours). Measures of error could not be calculated for the second graph because of limitations inherent in the FMF program related to coding.

The day and night graphs look very different. Catch rates during the day are about half compared to night electrofishing, indicating that electrofishing samples collected during the day would not be comparable to those collected at night. The maximum size of bass collected for the day sample was higher than that of the night sample (22” vs 18”). The PSD and RSD-P of the day sample were higher than that of the night sample (50 vs. 30 and 16 vs. 8, respectively). This appeared to be due to reduced catches of bass between 8” and 13”. Catch of larger fish appeared similar. Length-at-age information collected during daytime electrofishing should be as representative as that which was collected during nighttime electrofishing.

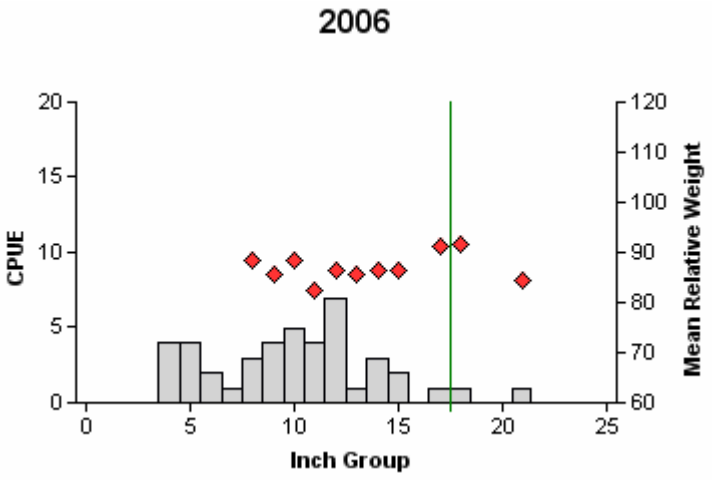
We believe that strong consideration should be given to modifying the current electrofishing procedures to allow for day electrofishing in reservoirs with reduced water clarity or in reservoirs where a similar comparison to this has been completed with satisfactory results. Compelling reasons for this change include increased safety, as well as greater ease of fish collection for age and growth analysis. If such a change were implemented, CPUE data for Aquilla reservoir should continue to be collected at night, but additional length-at-age information could be collected during the day.

Night Electrofishing



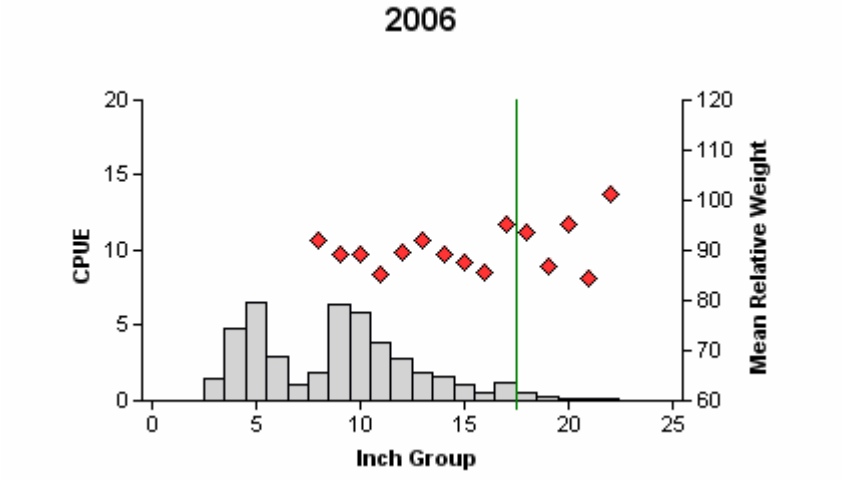
Effort =	1.0
Total CPUE =	95.0 (32; 95)
Stock CPUE =	73.0 (31; 73)
PSD =	30 (6)
RSD-P =	8 (2.8)

Day Electrofishing



Effort =	1.0
Total CPUE =	43.0
Stock CPUE =	32.0
PSD =	50
RSD-P =	16

All Day Electrofishing



Effort =	6.8
Total CPUE =	45.3 (12; 306)
Stock CPUE =	28.6 (14; 193)
PSD =	37 (3.7)
RSD-P =	15 (2.5)