

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-31

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2005 Survey Report

**Granbury Reservoir**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Granbury Reservoir were surveyed in 2005 using electrofishing and trap nets and in 2006 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Granbury Reservoir is an 8,700-acre impoundment located within the Brazos River system, Hood County, Texas. Constant water level is maintained by an open spillway and retention time has been estimated at 260 days. Granbury Reservoir has been hampered by golden alga since 2001. Habitat features mainly consisted of boat docks, extensive bulk heading, standing timber, and dead trees and stumps.
- **Management history:** Important sport fish include largemouth bass and striped bass. Both have been affected by annual, toxic golden alga blooms since 2001. Prior to this, largemouth bass were being regulated with a more restrictive 16-inch minimum length limit, five fish daily bag, which is still in place today. Stripers have been regulated with statewide regulations, and although more restrictive limits were considered in 2002, the desire to maintain consistent regulations for user groups on Granbury and Whitney Reservoirs out-weighed expected benefits at the time. Other species of fish have withstood significant mortalities over the past five years; fortunately the prey base has rebounded nicely year after year. Recent efforts to mitigate the loss of sport fish due to golden alga have included annual striped bass stockings since 2001 and Florida largemouth bass stockings in 2003 and 2004.
- **Fish community**
  - **Prey species:** Threadfin shad are still present in the reservoir in low density. Electrofishing catch rates for gizzard shad have returned to pre-golden [alga](#) levels, with similar numbers of the species available as prey to most sport fish. Electrofishing catch rates of bluegill and other sunfish species was lower than normal, with very few individuals reaching memorable sizes.
  - **Catfishes:** The channel catfish population has slowly shifted to one with larger, healthy individuals and low recruitment. Flathead and blue catfish, although present in the reservoir, make-up a small portion of the fishery.
  - **Temperate basses:** White bass catch rates have historically fluctuated in Granbury Reservoir and current gill netting catch rates are slightly above average. Individuals up to 15-inches are common. Striped bass are stocked on an annual basis and are present in the reservoir at a much-reduced density.
  - **Largemouth bass:** Largemouth bass electrofishing catch rates were well below pre-golden [alga](#) levels yet size structure was good. There were good numbers of preferred and memorable sized fish.
  - **White crappie:** White crappie are present in the reservoir. Although catch rates are low compared to pre-golden [alga](#) trap net surveys, individual relative weights are excellent.
- **Management strategies:** Continue annual stocking of striped bass at 10-fish/acre [and](#) Florida largemouth bass at 25-fish/acre in 2007 to mitigate losses due to golden alga. Conduct electrofishing and trap net surveys in 2007, [a](#) gill net survey in 2008, and [standard](#) monitoring with trap nets, gill nets, and electrofishing in 2009-2010. Conduct aquatic vegetation survey as required and an updated habitat survey prior to the next survey report. Continue assisting with golden alga research as needed.

## INTRODUCTION

This document is a summary of fisheries data collected from Granbury Reservoir in 2005-2006. 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 2005-2006 data for comparison.

### *Reservoir description*

Granbury Reservoir is an 8,700-acre impoundment of the Brazos River, located between Possum Kingdom and Whitney Reservoirs, Hood County. It was constructed in 1969 and is operated and controlled by the Brazos River Authority (BRA) for power plant cooling, flood control, municipal water supply, and recreation. Granbury Reservoir is moderately eutrophic with a mean and maximum depth of 18.0 and 75.0 feet. Water levels remain constant with an open spillway, and average retention time is estimated at 260 days. Habitat consists of extensive bulk heading, boat docks, standing timber, dead trees, stumps, limited amounts of rock riprap, and natural bluff. Native aquatic plants present are cattail and bulrush. Boat access is adequate and consists of five public boat ramps and several private boat ramps. Bank fishing access is poor. Other descriptive characteristics for Granbury Reservoir are in Table 1.

### *Management history*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Tibbs and Baird 2002) included:

1. Sample the reservoir in 2002 and 2003 using electrofishing, gill netting, and trap netting.  
**Action:** Full surveys were conducted in 2002 and 2003 to collect post-golden alga data on sport fish in the reservoir. These data sets were then presented in media news releases and public meetings to update and educate constituents about golden alga and the status of the fishery. These data sets are currently being used by a variety of agencies conducting research on golden alga and affected reservoirs.
2. Stock striped bass at 20-fish/acre in 2002 and 10-fish/acre thereafter depending on the extent of golden alga mortality in subsequent years.  
**Action:** Striped bass were stocked at 20-fish/acre in 2002 to mitigate losses of these valuable sport fish to golden alga. Monitoring data in 2002 did not indicate a need for the higher stocking rate, so striped bass were stocked at 10-fish/acre in 2003. In 2004 only 5-fish/acre were stocked. However in 2005, 15-fish/acre were stocked.
3. Consider regulation changes pending additional monitoring data.  
**Action:** Potential regulation changes were considered, but were not pursued due to golden alga.

**Harvest regulation history:** Sportfishes in Granbury Reservoir are currently managed with statewide regulations with the exception of largemouth bass (Table 2). Prior to 1995, largemouth bass were managed with a 14-inch minimum length limit. A 16-inch minimum length limit was implemented in 1995 to improve the population size structure – and still exists today.

**Stocking history:** Granbury Reservoir has received striped bass fingerling stockings, with few exceptions, on an annual basis since 1972. Channel catfish were stocked twice: once in 1969 at 43-fish/acre, and again with 300 adults in 1993. Blue catfish were stocked at 10-fish/acre, with limited success, in 1991. Largemouth bass were originally stocked into Granbury at 15-fish/acre in 1969, and in the early 1970's at varying densities. A small stocking of Florida largemouth bass occurred in 1986 (i.e.,

8178 fish), and heavy stockings of nearly 50-fish/acre in 1989, 1994, and 1995. Prey species have never been stocked into the reservoir. The complete stocking history is in Table 3.

**Vegetation/habitat history:** Granbury Reservoir only supports a few species of aquatic vegetation. A few upper-reservoir areas hold emergent species like cattail (*Typha* spp.) and bulrush (*Scirpus* spp.). Little if any submerged species of vegetation exists in the reservoir, and noxious plants are not currently a problem.

## METHODS

Fishes were collected by electrofishing (1.5 hours at 18 5-min stations), gill netting (10 net nights at 10 stations), and trap netting (10 net nights at 10 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 2002).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (*W<sub>r</sub>*)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Fish aging became optional in 2004, and no new age and growth data were collected from the 2005/2006 survey. The most recent age and growth information for Granbury Reservoir can be found in Tibbs and Baird (2002). Sources for water level data were the United States Geological Survey (USGS) website and Brazos River Authority.

## RESULTS AND DISCUSSION

**Habitat:** Littoral zone habitat consists primarily of extensive bulk heading, boat docks, standing timber, dead trees and stumps, and limited amounts of rock riprap and natural bluff. The most recent littoral zone habitat survey was conducted in 1998 (DiCenzo and Mitchell 1998).

**Creel:** A creel was not conducted during this survey period; therefore no creel data are available for Granbury Reservoir to date.

**Prey species:** Threadfin shad are still present in the reservoir in low density; CPUE was 14/h. Electrofishing catch rates of gizzard shad were 99.3/h, similar to pre-golden-alga rates. Index of vulnerability (IOV) for gizzard shad was good, indicating that 78% of gizzard shad were available to existing predators; this was the highest IOV estimate since the 1998 survey (Figure 2). Total CPUE of bluegill was considerably lower in 2005 compared to the 2001, 2002, and 2003 surveys, and the population continues to be dominated by smaller individuals (Figure 3). Other sunfish species contributed minimally to the prey base (Appendix A).

**Channel catfish:** The channel catfish population continues to recruit young fish to legal sizes even though these individuals are seldom seen in gill net samples. Gill net catch rates for channel catfish were 5.5/nn in 2001, 5.0/nn in 2002, 4.5/nn in 2003, 4.8/nn in 2004, and 2.4/nn in 2006 (Figure 4). Relative weights (*W<sub>r</sub>*) of channel catfish are typically excellent, normally ranging from 90 to 120. No blue or flathead catfish were collected.

**White bass:** The gill net catch rate of white bass varied considerably from 2001 to 2006. The lowest CPUE was 0.5/nn in 2003 and highest was 5.6/nn in 2004. The 2006 catch rate was slightly above average at 2.7/nn (Figure 5). White bass condition is typically excellent.

**Striped bass:** Like white bass, the catch rate of striped bass has been sporadic since 2001. The gill net catch rates were 0.4/nn in 2001, 1.9/nn in 2002, 0.2/nn in 2003, 1.7/nn in 2004, and 0.2/nn in 2006 (Figure 6). Condition of legal-sized striped bass was also excellent. Few individuals have reached the preferred size category of 30 inches or more during recent gill net surveys.

**Largemouth bass:** The electrofishing catch rate of largemouth bass was 30.7/h in 2005, less than half the 65.3/h in 2003 and among the lowest in the district. Size structure was adequate with PSDs ranging from 45 to 75 since 1998 (Figure 7). Body condition in 2005 was good (relative weights over 90) for nearly all size classes of fish. Florida largemouth bass influence has remained relatively constant as Florida alleles have ranged from 45 to 51% in the last three surveys (Table 4).

**White crappie:** The trap net catch rate of white crappie was 2.5/nn in 2005, similar to the 2003 (2.0/nn) and 2002 (4.4/nn) surveys. Mean relative weights were over 90 for all size classes in 2005 and similar to values observed in all previous surveys (Figure 8). Although the white crappie population is a low density one, individuals commonly approach trophy sizes of 15 inches or more.

## Fisheries management plan for Granbury Reservoir, Texas

Prepared – July 2006.

**ISSUE 1:** Golden alga continues to kill significant numbers of sport and prey species in the reservoir during winter and early spring months.

### MANAGEMENT STRATEGY

1. Sample the reservoir biannually for the next four years using electrofishing, gill netting, and trap netting. Supplementary monitoring may be required if golden alga blooms cause additional mortality.
2. Continue stocking striped bass at 15/acre annually; adjust stocking rate as needed.
3. Request stocking of Florida largemouth bass at 25/acre in spring 2007.
4. Make fishery data available to agencies researching golden alga, and aid with this research when necessary.

**ISSUE 2:** The addition of new residential areas, canals, and bulkheading has altered the littoral habitat of the reservoir within the last decade. An updated physical habitat survey has not been conducted for Granbury Reservoir since 1998.

### MANAGEMENT STRATEGY

1. Perform a physical habitat survey prior to the next report using current technology.

**ISSUE 3:** Despite recent golden algal blooms, gill net catch rates for channel catfish remain good and relative weights ( $W_r$ ) are excellent.

### MANAGEMENT STRATEGY

1. Publicize this healthy catfish population to constituents, local angler groups, guides, etc.

### SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes electrofishing and trap netting in 2007 and 2009, and gill netting in 2008 and 2010 (Table 5). The 2007 and 2008 surveys are necessary to evaluate and monitor the continual effects of golden-alga-related fish kills on the reservoir. The 2009 and 2010 survey is a regularly scheduled survey. A physical habitat survey will be performed in summer 2009.

## LITERATURE CITED

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- Tibbs, J. and M. Baird. 2002. Statewide freshwater fisheries monitoring and management program survey report for Granbury Reservoir, 2001. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- DiCenzo, V.J. and J. Mitchell. 1998. Statewide freshwater fisheries monitoring and management program survey report for Granbury Park Reservoir, 1997. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
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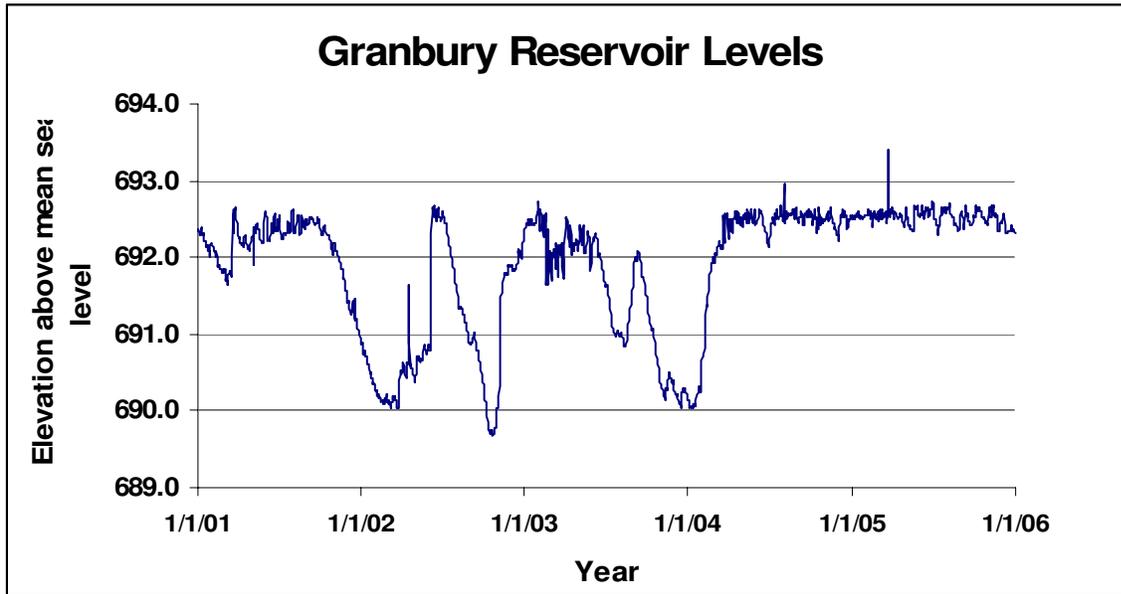


Figure 1. Daily mean water levels for Granbury Reservoir, from January 1, 2001 through January 1, 2006. Conservation pool level (693 feet above mean sea level).

Table 1. Characteristics of Granbury Reservoir, Texas.

Characteristic	Description
Year Constructed	1969
Controlling authority	Brazos River Authority (BRA)
County	Hood
Reservoir type	Mainstream
Shoreline Development Index (SDI)	8.4
Conductivity	2400 umhos/cm

Table 2. Harvest regulations for Granbury Reservoir, Texas.

Species	Bag Limit	Length limit (inches)
Catfish: Channel and Blue	25 (any combination)	12" minimum
Catfish, Flathead	5	18" minimum
Bass, White	25	10" minimum
Bass: Largemouth	5	16" minimum
Bass: Spotted and Smallmouth	5 (any combination)	No minimum
Crappie: White and Black	25 (any combination)	10" minimum

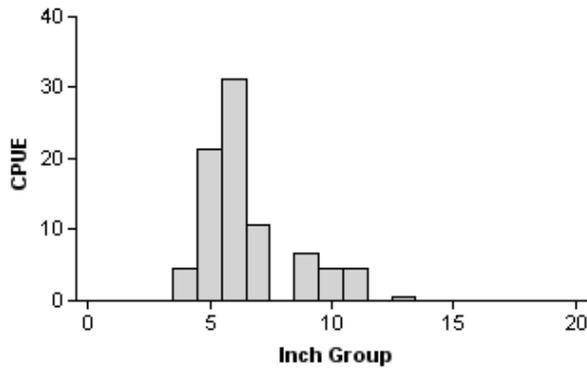
Table 3. Stocking history of Granbury Reservoir, Texas. Size Categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Species	Year	Number	Size
Blue catfish	1991	86,343	FGL
Channel catfish	1969	374,675	ADL
	1993	300	
	Total	374,975	
Striped bass	1972	27,865	FGL
	1973	172,970	
	1974	170,000	
	1975	39,998	
	1976	86,154	
	1979	85,791	
	1981	100,502	
	1983	176,332	
	1989	87,000	
	1990	93,315	
	1994	143,656	
	1995	43,807	
	1997	87,068	
	1998	88,206	
	1999	88,121	
	2000	44,000	
	2001	2,100,000	
	2002	174,657	
	2003	85,444	
	2004	43,271	
2005	125,155		
Total	4,063,312		
Florida largemouth bass	1986	8,178	FGL
	1989	424,524	FGL
	1994	435,331	FGL
	1995	435,924	FGL
	2003	425,723	FGL
	2004	214,164	FGL
Total	1,943,844		
Largemouth bass	1969	126,640	ADL
	1970	1,700,000	
	1972	30,160	
	1993	200	
	Total	1,857,000	

## Gizzard Shad

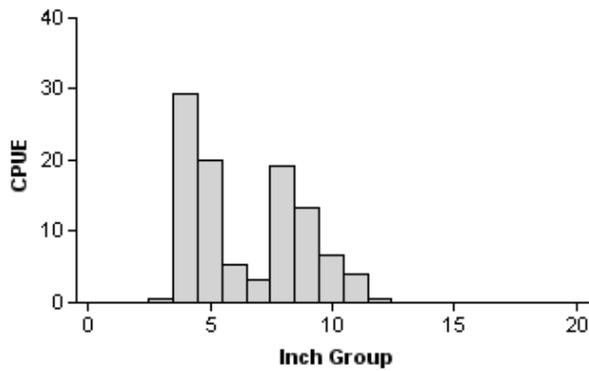
1998

Effort = 1.5  
 Total CPUE = 84.7 (22; 127)  
 IOV = 80.31 (0.06)



2001

Effort = 1.5  
 Total CPUE = 102.7 (26; 154)  
 IOV = 57.14 (0.05)



2002

Effort = 1.5  
 Total CPUE = 55.3 (31; 83)  
 IOV = 62.79 (0.14)

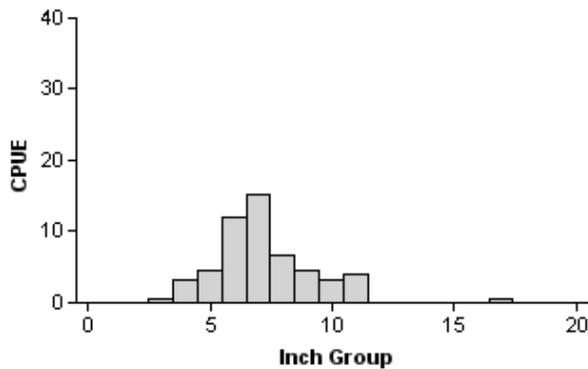
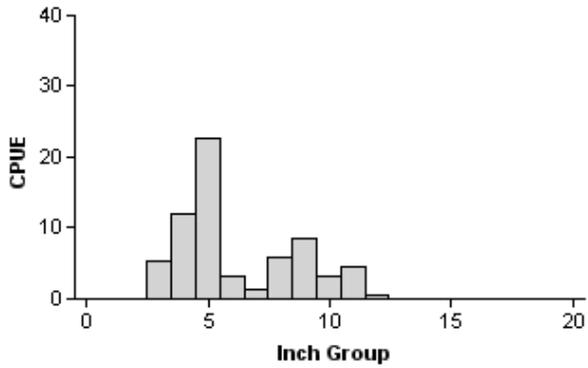


Figure 2. Number of gizzard shad caught per hour (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas.

## Gizzard Shad

2003

Effort = 1.5  
 Total CPUE = 68.0 (24; 102)  
 IOV = 65.69 (0.05)



2005

Effort = 1.5  
 Total CPUE = 99.3 (30; 149)  
 IOV = 78.52 (0.05)

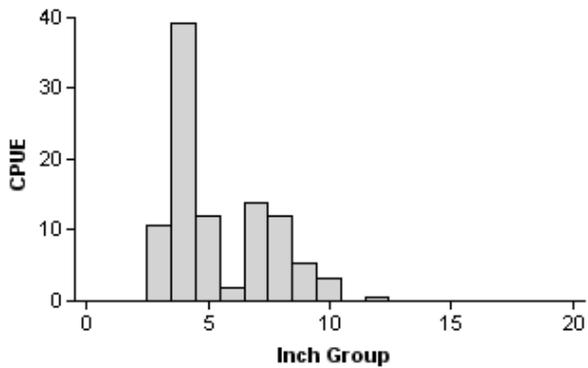
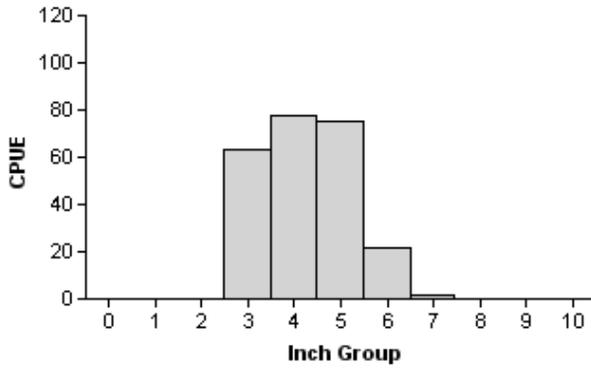


Figure 2 continued. Number of gizzard shad caught per hour (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas.

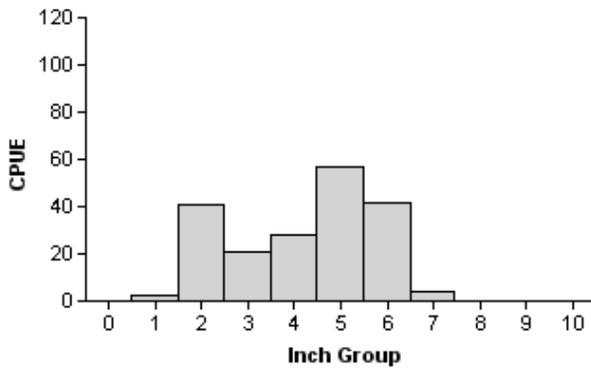
# Bluegill

1998



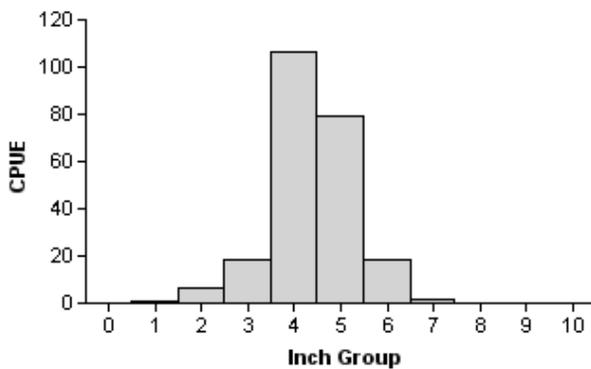
Effort = 1.5  
 Total CPUE = 239.3 (19; 359)  
 Stock CPUE = 239.3 (19; 359)  
 PSD = 10.0 (0.04)

2001



Effort = 1.5  
 Total CPUE = 194.7 (17; 292)  
 Stock CPUE = 151.3 (19; 227)  
 PSD = 30.0 (0.06)

2002



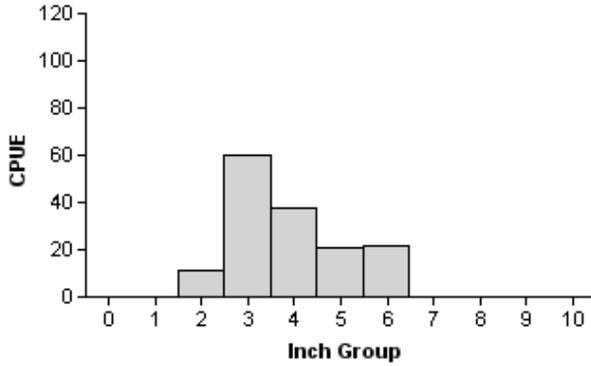
Effort = 1.5  
 Total CPUE = 232.7 (22; 349)  
 Stock CPUE = 225.3 (22; 338)  
 PSD = 9.0 (0.02)

Figure 3. Number of bluegill caught per hour (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas.

# Bluegill

2003

Effort = 1.5  
 Total CPUE = 151.3 (24; 227)  
 Stock CPUE = 140.0 (25; 210)  
 PSD = 16.0 (0.04)



2005

Effort = 1.5  
 Total CPUE = 103.3 (22; 155)  
 Stock CPUE = 80.7 (23; 121)  
 PSD = 10.0 (0.04)

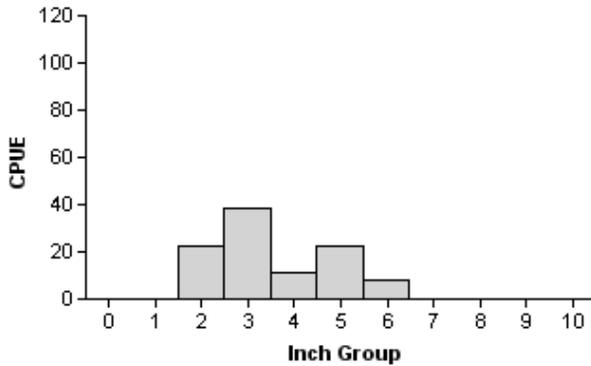
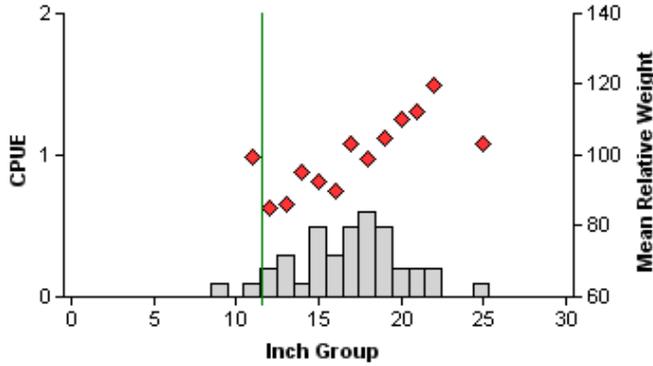


Figure 3 continued. Number of bluegill caught per hour (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas.

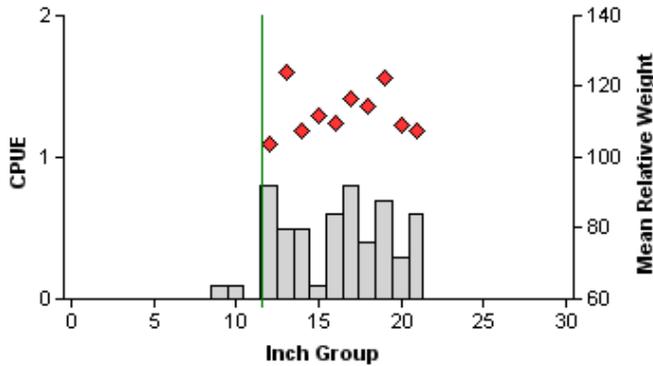
# Channel catfish

1998



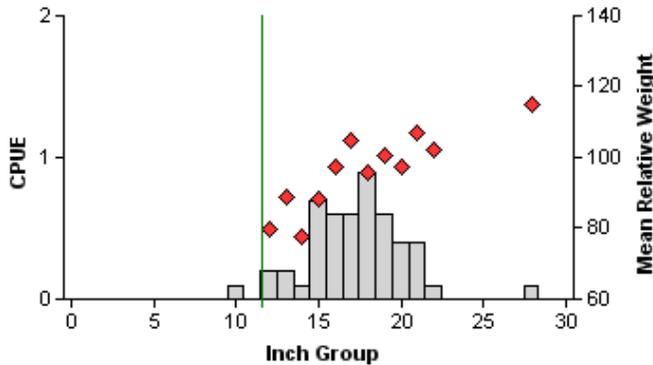
Effort = 10.0  
 Total CPUE = 3.9 (14; 39)  
 Stock CPUE = 3.8 (15; 38)  
 PSD = 68.0 (0.08)  
 RSD-P = 3.0 (0.03)  
 RSD-M = 0.0 (0)

2001



Effort = 10.0  
 Total CPUE = 5.5 (12; 55)  
 Stock CPUE = 5.3 (12; 53)  
 PSD = 64.0 (0.09)  
 RSD-P = 0.0 (0)  
 RSD-M = 0.0 (0)

2002

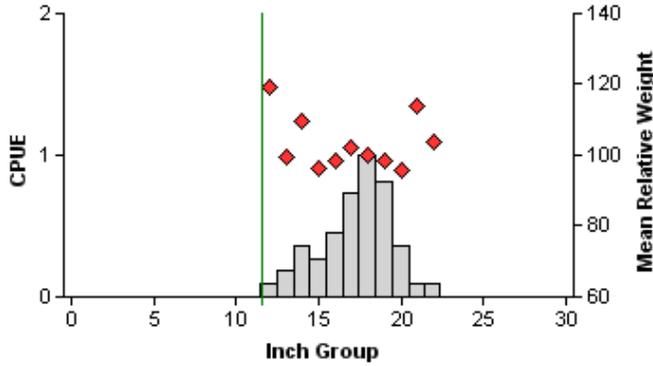


Effort = 10.0  
 Total CPUE = 5.0 (13; 50)  
 Stock CPUE = 4.9 (14; 49)  
 PSD = 76.0 (0.09)  
 RSD-P = 2.0 (0.02)  
 RSD-M = 2.0 (0.02)

Figure 4. Number of channel catfish caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for spring gill net surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

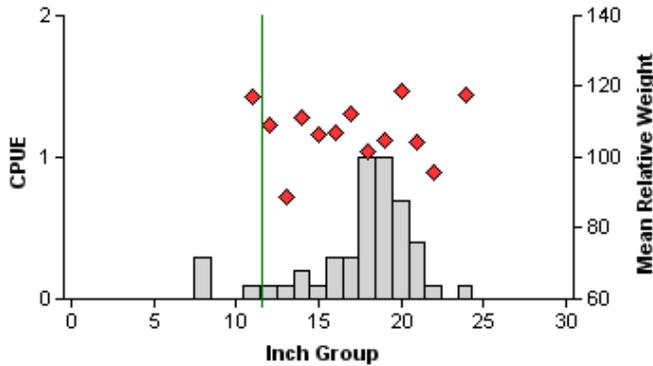
## Channel catfish

2003



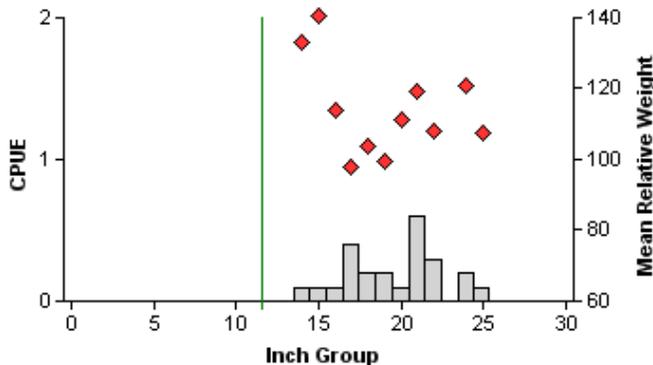
Effort = 11.0  
 Total CPUE = 4.5 (22; 49)  
 Stock CPUE = 4.5 (22; 49)  
 PSD = 80.0 (0.05)  
 RSD-P = 0.0 (0)  
 RSD-M = 0.0 (0)

2004



Effort = 10.0  
 Total CPUE = 4.8 (25; 48)  
 Stock CPUE = 4.5 (24; 45)  
 PSD = 87.0 (0.05)  
 RSD-P = 2.0 (0.02)  
 RSD-M = 0.0 (0)

2006



Effort = 10.0  
 Total CPUE = 2.4 (26; 24)  
 Stock CPUE = 2.4 (26; 24)  
 PSD = 92.0 (0.08)  
 RSD-P = 12.0 (0.07)  
 RSD-M = 0.0 (0)

Figure 4 continued. Number of channel catfish caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for spring gill net surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

## White bass

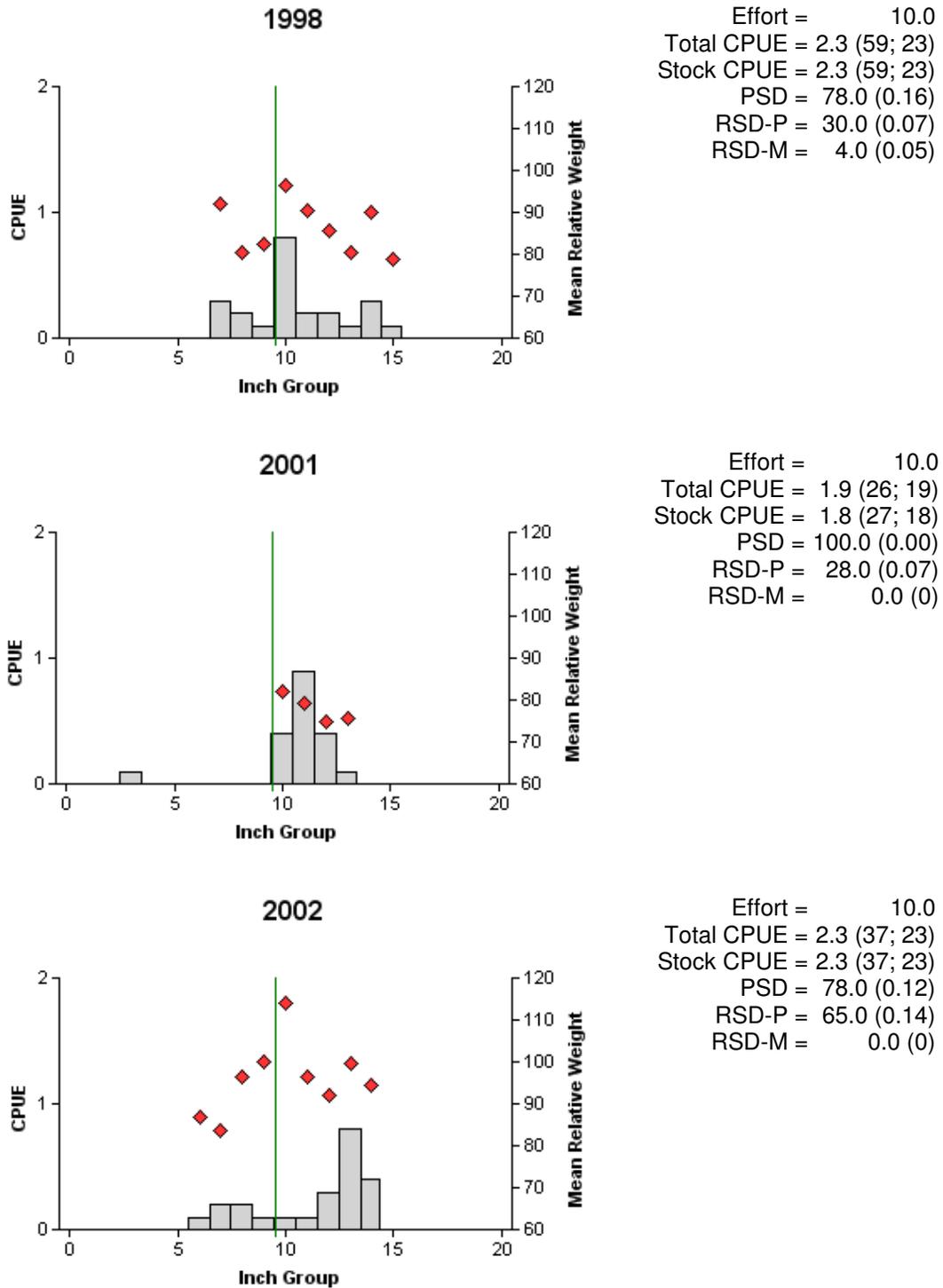


Figure 5. Number of white bass caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for spring gill net surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

## White bass

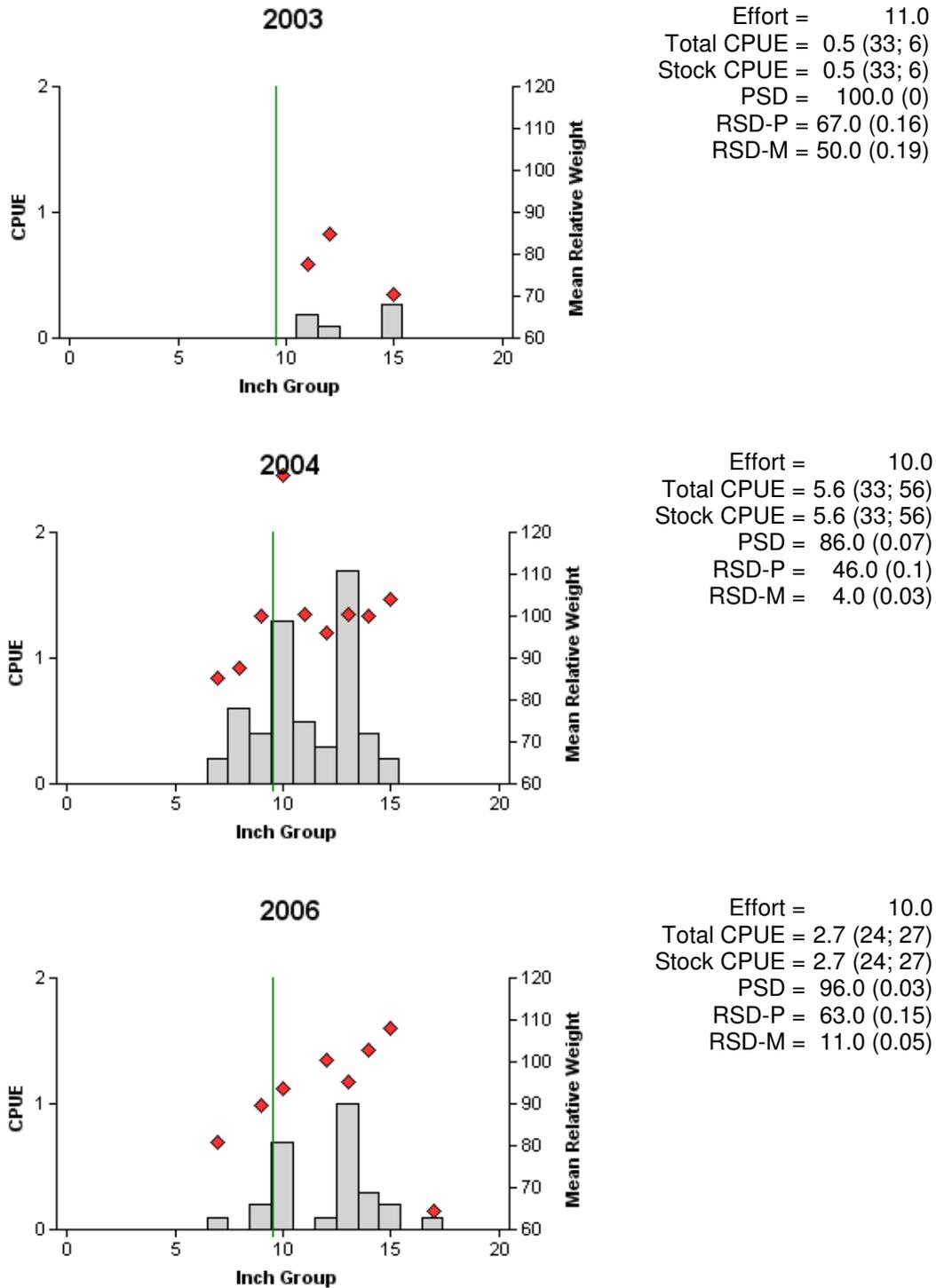


Figure 5 continued. Number of white bass caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for spring gill net surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

## Striped bass

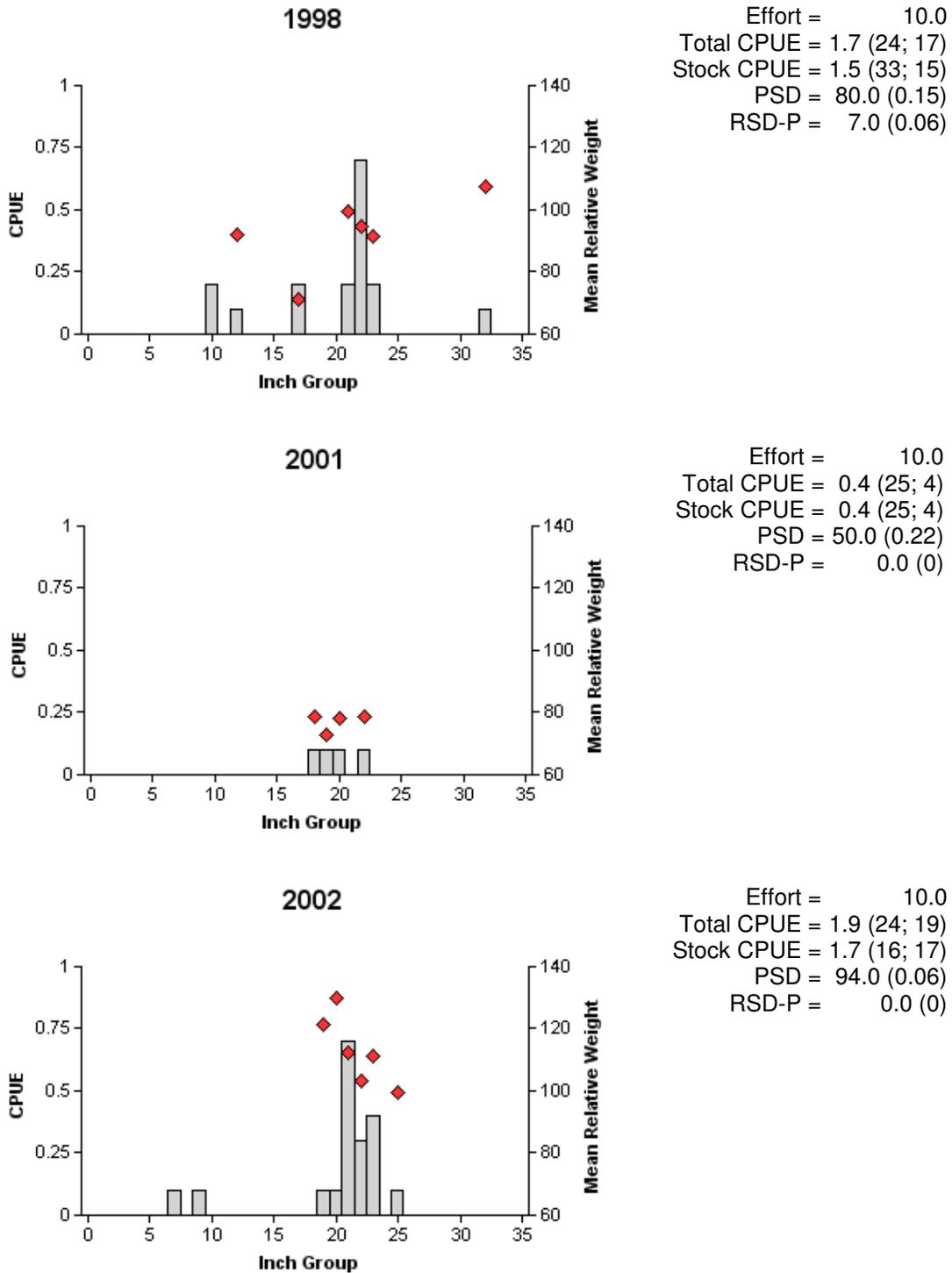


Figure 6. Number of striped bass caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for spring gill net surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

## Striped bass

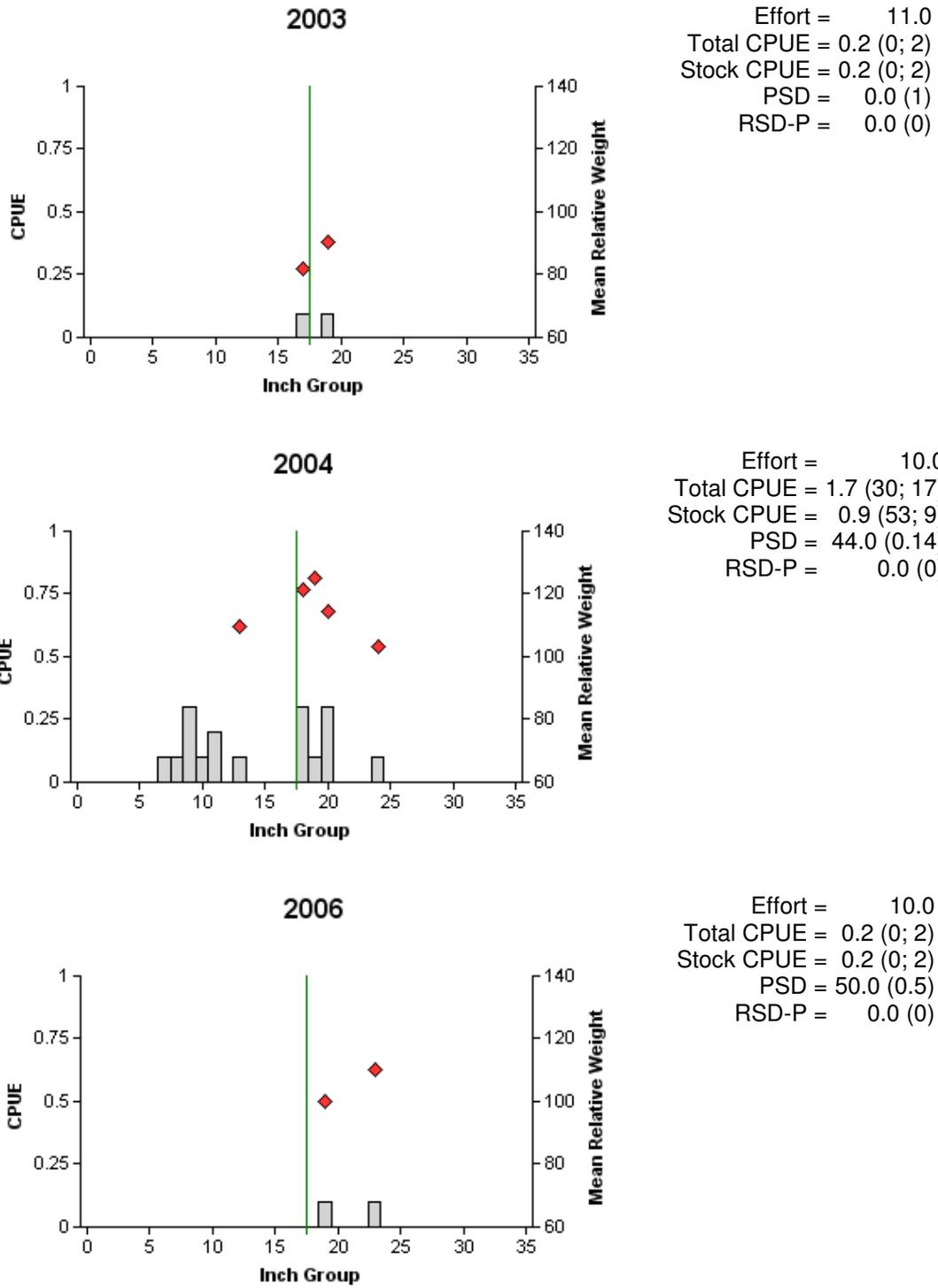


Figure 6 continued. Number of striped bass caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for spring gill net surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

## Largemouth bass

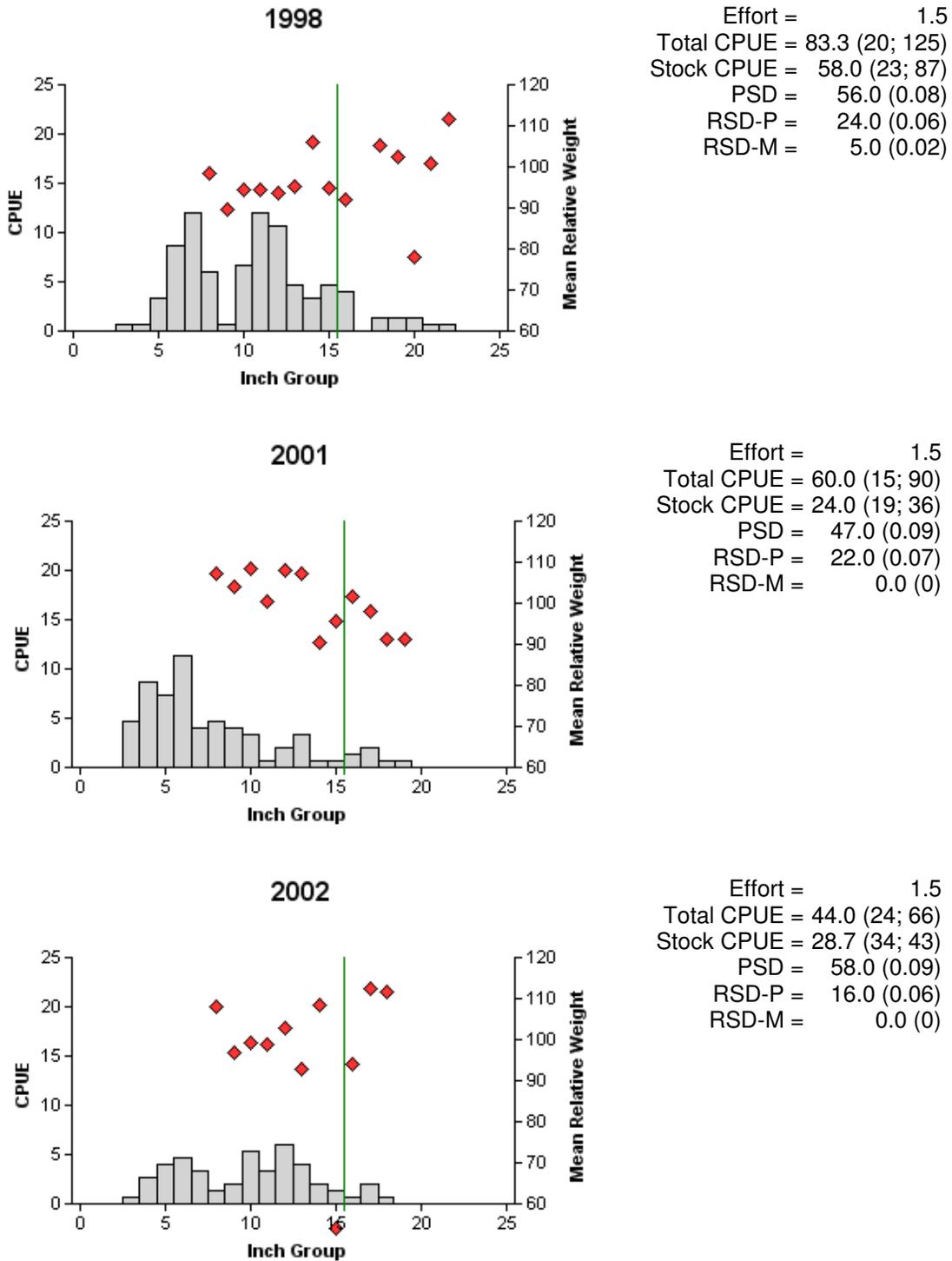


Figure 7. Number of largemouth bass caught per hour (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

## Largemouth bass

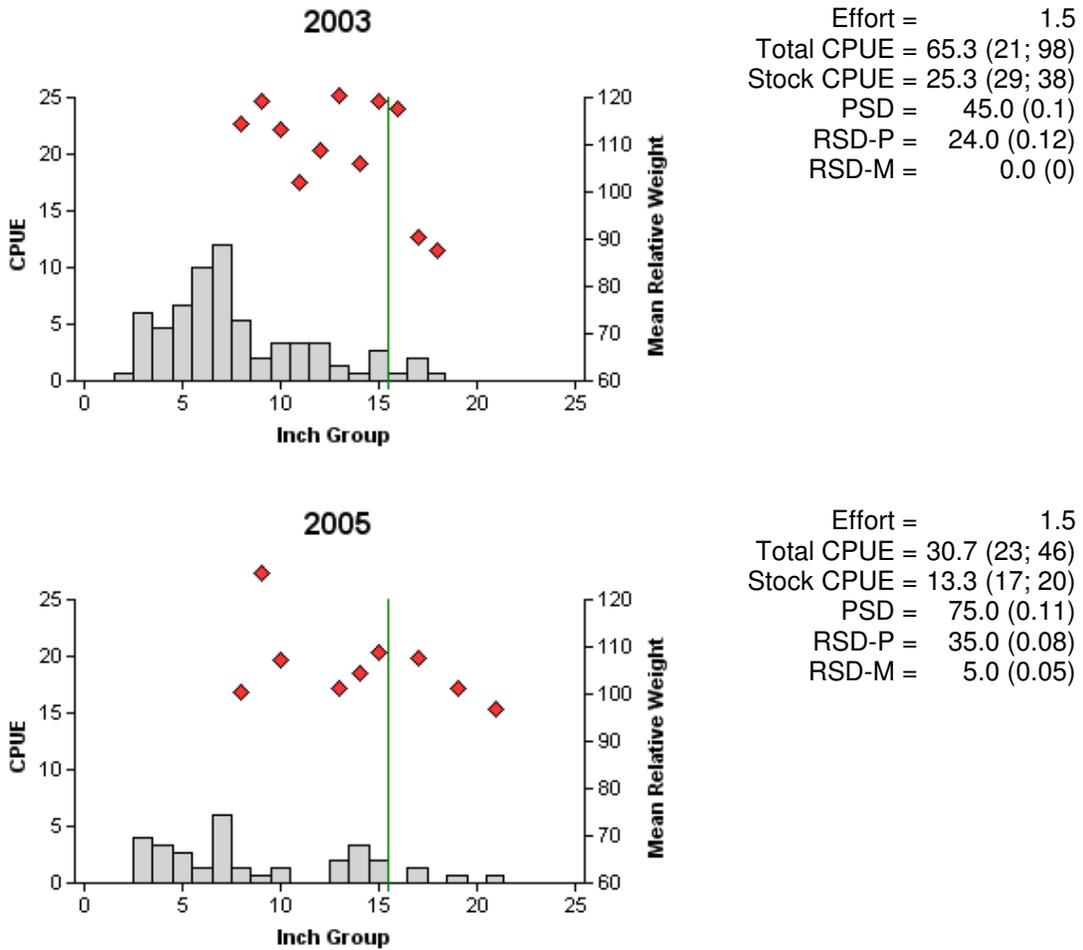


Figure 7 continued. Number of largemouth bass caught per hour (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

Table 4. Results of genetic analysis of largemouth bass collected by fall electrofishing, Granbury Reservoir, Texas, 1998, 2001, and 2005. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
1998	30	6	10	9	8	45.0	17.1
2001	29	2	7	17	3	48.3	6.7
2005	27	1	2	23	1	50.7	4.0

## White crappie

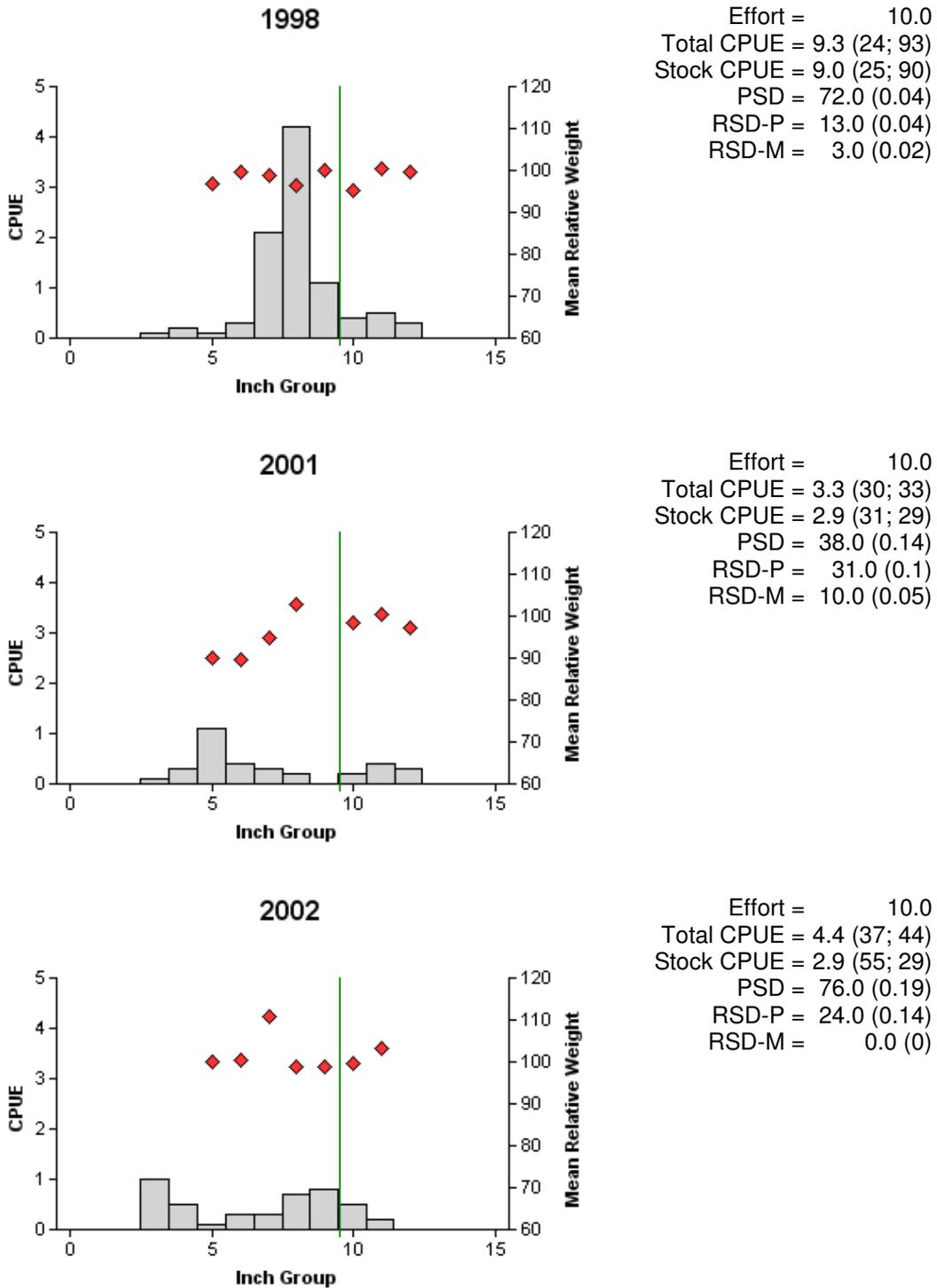


Figure 8. Number of white crappie caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall trap netting surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

# White crappie

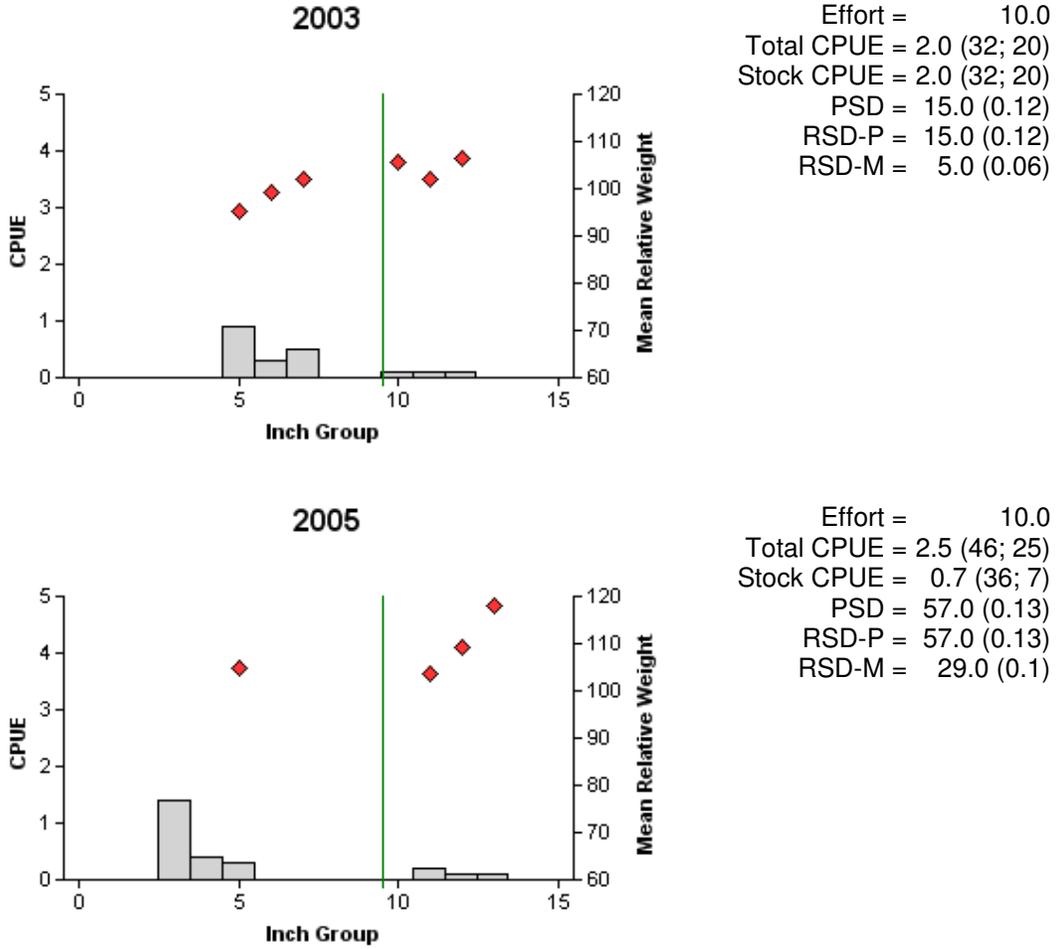


Figure 8 continued. Number of white crappie caught per net night (CPUE) (RSE and N in parentheses) and population indices (SE in parentheses) for fall trap netting surveys, Granbury Reservoir, Texas. The vertical line represents the minimum length limit at the time of the survey.

Table 5. Proposed sampling schedule for Granbury 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.

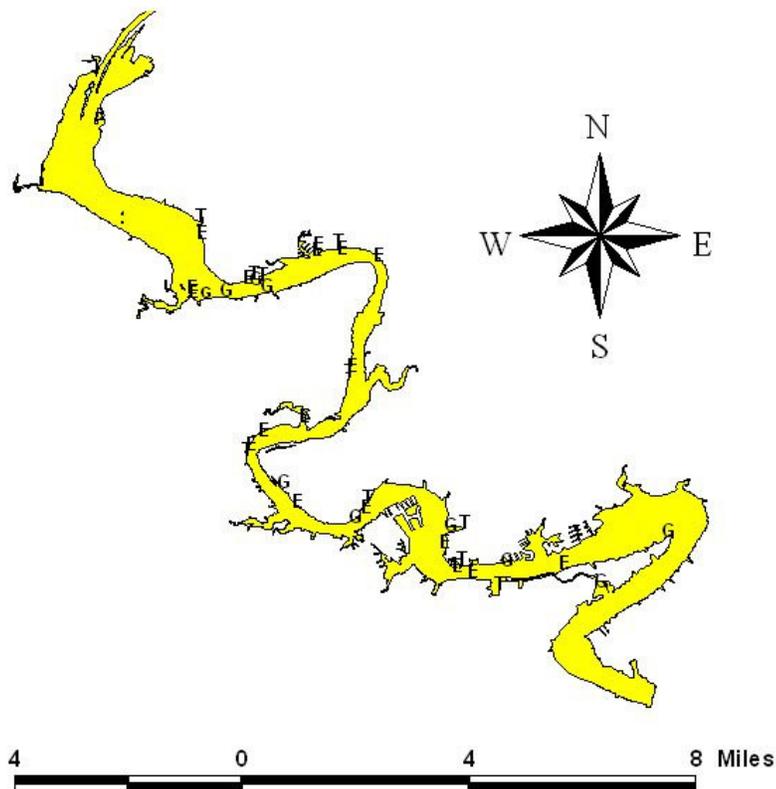
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2006-Spring 2007					
Fall 2007-Spring 2008	A	A	A		
Fall 2008-Spring 2009					
Fall 2009-Spring 2010	S	S	S		S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Granbury Reservoir, Texas, 2005-2006.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					149	99.3
Threadfin shad					21	14.0
Channel catfish	24	2.40				
White bass	27	2.70				
Striped bass	2	0.2				
Green sunfish					13	8.7
Warmouth					3	2.0
Bluegill					155	103.3
Longear sunfish					12	8.0
Redear sunfish					6	4.0
Largemouth bass					46	30.67
White crappie			25	2.50		

## APPENDIX B



Location of sampling sites, Granbury Reservoir, Texas, 2005-2006. Trap netting, gill netting, and electrofishing stations are indicated by T, G, and E, respectively. Water level was at full pool at time of sampling.