

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-34

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

Granger Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Granger Reservoir was surveyed in 2008 using trap nets and boat electrofisher, and in 2009 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:** Granger Reservoir is a 4,009-acre impoundment of the San Gabriel River in Williamson County. The reservoir is located approximately 40 miles northeast of Austin, Texas, within the Brazos River drainage. It was constructed in 1980 by the U. S. Army Corps of Engineers (USACE) for purposes of flood control and water conservation. Granger Reservoir has a drainage area of approximately 709 square miles and a shoreline length of about 40 miles. High turbidity and fluctuating water levels have deterred the establishment of aquatic vegetation. Reservoir bank slope is relatively flat and small changes in water level (1-2 feet) can have a large impact on the abundance of shoreline habitat.
- **Management history:** Important sport fishes include white crappie, white bass, largemouth bass, and catfish. A creel survey conducted in the spring of 2005 showed white crappie was the most sought after species (61.5% directed angler effort) followed by catfishes (16.8%), white bass (5.1%), and largemouth bass (2.5%; Bonds and Magnelia 2005). Blue Catfish were stocked in 1995 and 1996 to provide additional angling opportunities and utilize an abundant shad population.
- **Fish Community**
 - **Prey species:** Threadfin shad continued to be present in the reservoir. Gizzard shad continued to be present and most remained available as prey to most sport fish. Bluegill were present.
 - **Catfishes:** Blue catfish remained the dominant catfish species in the reservoir. Channel and flathead catfish were present in lower densities.
 - **White bass:** White bass numbers increased in 2009. According to the 2005 creel survey this species was popular with bank anglers fishing in the upper reaches of the reservoir in the early spring. Most white bass reached legal length in two years.
 - **Largemouth bass:** Electrofishing catch rate for largemouth bass increased in 2008. Increased catch rate for this species was due to strong year classes produced in 2006 and 2007, when water level was above conservation pool. Size distribution and body condition were good. Most largemouth bass reached legal length within one to two years. Supplemental stockings of the Florida sub-species of largemouth bass were made in the early 1990s. These stockings did not increase the genetic influence of the Florida sub-species.
 - **White crappie:** White crappie were abundant and had good body condition. Most white crappie reached legal length within two years.
- **Management Strategies:** Based on current information, the reservoir should continue to be managed with existing regulations. According to the latest creel survey most of the directed fishing effort is for white crappie. Year class production and relative abundance fluctuate, so trap net surveys should be conducted annually to better monitor the population dynamics of this species. Blue catfish have established a self-sustaining population. Additional blue catfish stockings were not needed. Water hyacinth (*Eichhornia crassipes*) was found in 2004, but has not been documented on recent surveys.

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INTRODUCTION

This document is a summary of fisheries data collected from Granger Reservoir in 2008-2009. 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 2008-2009 data for comparison.

Reservoir Description

Granger Reservoir is a 4,009-acre impoundment of the San Gabriel River in Williamson County. The reservoir is located approximately 40 miles northeast of Austin, Texas, within the Brazos River drainage. It was constructed in 1980 by the U. S. Army Corps of Engineers (USACE) for purposes of flood control and water conservation. Granger Reservoir was eutrophic with a mean TSI chl-*a* of 46.48, which was higher than previous samples (Texas Commission on Environmental Quality 2008). Hydrilla (*Hydrilla verticillata*), a non-native aquatic plant, was first discovered near Wilson Fox boat ramp in 2003. It was eliminated with an herbicide applied by the USACE. High reservoir inflows in late 2004 may have eliminated water hyacinth (*Eichhornia crassipes*) documented in the upper San Gabriel arm of the reservoir in 2004. Water level has fluctuated since 2004. In late 2004 and most of 2007, persistent rains caused the reservoir to increase significantly above conservation pool (Figure 1). Since July 2008, the reservoir level has remained below conservation pool. A habitat survey has not been conducted since 2004, but the reservoir was below conservation pool at the time of sampling and little shoreline habitat was available. Boat access consisted of 5 public boat ramps. Bank fishing access is good within the San Gabriel Wildlife Management Area, which includes a primitive boat launch for canoes and kayaks. The USACE operates four parks with good bank access. Wilson Fox Park contained a fishing pier with accommodations for the physically challenged. Other descriptive characteristics for Granger Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Bonds and Magnelia 2005) included:

1. Conduct annual trap net surveys to monitor white crappie population dynamics.
Actions: Trap net surveys were conducted every year since 2004. In 2006, standard trap nets were supplemented with experimental tandem trap nets to evaluate catch rates of crappie. Age and growth data were recorded from 2004 to 2007.
2. Communicate fishing opportunities to anglers through appropriate media outlets.
Actions: News releases and updates to the TPWD website describe fishing opportunities on Granger Reservoir. A brochure called *White Bass Fishing in Central Texas* was updated recently, and has a section describing the bank fishing access on the San Gabriel river arm of the reservoir specifically for white bass fishing.
3. Conduct annual aquatic vegetation surveys and recommend treatment if necessary.
Action: Visual monitoring during routine sampling was sufficient to document expansion r introductions of nuisance species.

Harvest regulation history: Sport fishes in Granger Reservoir are currently managed with statewide regulations (Table 2).

Stocking history: Granger Reservoir has not been stocked since the late 1990's. Blue catfish were stocked in 1995 and 1996. Channel catfish were stocked in 1979, 1990, and 1996. The complete stocking history is in Table 3.

Vegetation/habitat history: High turbidity and fluctuating water level of Granger Reservoir make it difficult for aquatic vegetation to become established. Water clarity (secchi depth) is typically less than 1 foot. Few aquatic plants were observed in Granger Reservoir prior to 2003. In 2003, hydrilla was

discovered near Wilson Fox Park boat ramp and was eliminated by the USACE with an aquatic herbicide. In 2004, water hyacinth was observed in the upper San Gabriel arm of the reservoir, totaling about 0.3 acres (Table 4). High river inflows may have eliminated these in late 2004.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (15 net nights at 15 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 2008).

Blue catfish were also collected by low-frequency (7.5 pulses-per-second) electrofishing (1.5 hours at 18 5-min stations). These data were collected for an approved research study evaluating factors that affect the establishment of blue catfish populations in Texas reservoirs. Data recorded using this collection method were reported separately from the standard electrofishing (60 pulses-per-second) data. Survey sites using this method were randomly selected.

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). 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. Ages were determined for largemouth bass (Tier 1), white bass (Tier 2), and white crappie (Tier 1) using otoliths (TPWD, Inland Fisheries Division, unpublished manual revised 2008). Source for water level data was the United States Geological Survey (USGS) website. Source for water quality data was the Texas Commission on Environmental Quality (TCEQ) website.

RESULTS AND DISCUSSION

Habitat: In 2008 littoral habitat consisted primarily of standing timber, vegetated bank, and rocks (Table 4).

Prey species: Gizzard shad total electrofishing catch-per-unit-effort (CPUE) in 2008 was 129.0/h, which was lower than that recorded in 2004 (219.0/h). Gizzard shad appeared to be dominated by age-0 fish. No gizzard shad were aged, but fish measuring less than 5 inches were assumed to be age-0. Annual variability in production of young gizzard shad has occurred, but catch rates of older shad (>7 inches) have typically been less than 10.0/h. The index of vulnerability (IOV) for the gizzard shad sample was 91.5 (Figure 2), which indicates that most gizzard shad were less than 8 inches in length, making them susceptible to most predators. Threadfin shad were collected at the rate of 62.0/h in 2008, which is higher than the three previous surveys (2004 = 21.0/h, 2000 = 44.7/h, 1997 = 23.3/h).

Bluegill total electrofishing CPUE in 2008 (77.0/h) was higher than previous surveys (2004 = 40.0/h, 2000 = 0.0/h, 1997 = 12.7/h) (Figure 3). The fluctuation in bluegill and gizzard shad might be explained by inter-specific competition for zooplankton at larval stages (Noble 1981) and/or habitat changes due to fluctuating water level. Longear sunfish CPUE (20.0/h), warmouth (9.0/h), and redear sunfish (2.0/h) were consistent with previous surveys.

Catfishes: In 2005, blue catfish surpassed channel catfish as the predominant species of catfish with a catch rate of 3.0/nn (Bonds and Magnelia 2005). Gill net catch rate in 2009 slightly decreased (2.4/nn), with fewer small individuals in the population compared to the 2005 survey. This was probably a sampling effect, as effort was decreased in the 2009 survey. Low-frequency electrofishing data indicated that

length frequency distribution was similar to the 2005 survey (Figure 5). Gill netting catch rate for channel catfish was 1.8/nn in 2009 (Figure 6), which is double the catch rate of 2005 (0.9/nn) but the same observed in 2003 (1.8/nn).

Flathead catfish continued to be collected in low numbers (0.4/nn) (Figure 7). In the 2009 gill net survey, the majority of flathead catfish collected exceeded 20 inches, similar to 2005.

White bass: Since 2001, white bass total gillnet catch rate has increased (2001 = 0.8/nn, 2003 = 1.7/nn, 2005 = 2.9/nn, 2009 = 5.8/nn; Figure 8). The 2009 gill net survey showed a contraction in the size distribution (7 to 13 inches), compared to the two previous surveys (6 to 16 inches). The gillnet CPUE of harvestable white bass (≥ 10 inches) increased in 2009 (4.4/nn) compared to 2005 (1.3/nn).

Largemouth bass: Largemouth bass electrofishing CPUE (33.0/h) in 2008 was higher than any survey since 1989 (Figure 9). Largemouth bass relative abundance declined between 1989 and 2000 (1989 = 42.7/h, 1991 = 30.7/h, 1994 = 28.7/h, 1997 = 15.3/h, 2000 = 4.4/h). Higher bluegill production could positively impact age-0 largemouth bass recruitment by providing small enough prey for age-0 largemouth bass (Allen et al. 1999). Since the majority of largemouth bass collected in 2008 were age-1 (Figure 10), the increase in CPUE could have resulted from the water level peak in 2007 (Figure 1). Increased water level on this reservoir likely has a positive impact on the abundance of centrarchid species, by providing flooded terrestrial habitat and increased zooplankton abundance (i.e. increased littoral zone productivity). During low water periods there is almost no habitat available for these species.

White crappie: The total trap net catch rate of white crappie in 2008 remained high at 9.0/nn (Figure 10). This is near the CPUE average of 11.8/nn between 1998 and 2007. Historically, water elevation seemed to be a factor influencing year class strength at age-1. A strong year class was produced in 2004, which is probably the result of high water elevation during much of the year (Appendix B). Regression analysis of age-0 crappie CPUE versus mean winter (January-March) reservoir discharge on Granger Reservoir from 1994 to 2001 indicated a strong relationship existed ($R^2 = 0.779$, $P = 0.048$). A marginally significant relationship existed between the number of high water days (>1 foot above full pool) in spring (March – April) and age-0 catch ($R^2 = 0.602$, $P = 0.069$) (TPWD, unpublished data, 2002). White crappie mean age at 10 inches was about 1.5 years (Figure 11). The 2008 trap net survey showed a size distribution of 2 to 13 inches. The trap net CPUE of harvestable white crappie (≥ 10 inches) decreased in 2008 (0.8/nn) compared to 2007 (4.6/nn). Relative weights were near optimal for all size classes ($W_r = 93$ to 107).

Fisheries management plan for Granger Reservoir, Texas

Prepared – July 2009.

ISSUE 1: A high quality blue catfish fishery exists at Granger Reservoir of which anglers may not be aware of.

MANAGEMENT STRATEGY

4. Promote the blue catfish fishery with news releases.

ISSUE 2: Exotic plant species (hydrilla and water hyacinth) have been documented in past years on the reservoir. Expansion of these species could restrict access.

MANAGEMENT STRATEGIES

1. Continue visual inspections for exotic species on routine sampling surveys.
2. If exotic species are documented conduct a reservoir wide aquatic vegetation survey.
3. Recommend proper course of action to controlling authority should treatment be required.

ISSUE 3: Granger Reservoir has a low amount of shoreline habitat. This has resulted in a below average largemouth bass population. Abundance of this species seems to improve each time water level increases (i.e. strong year classes are produced). Establishing emergent aquatic vegetation could help improve habitat for largemouth bass. It could also stabilize shorelines and improve water clarity. The reservoir is also a popular waterfowl hunting destination and emergent vegetation could improve the reservoir's attraction to migrating waterfowl.

MANAGEMENT STRATEGIES

1. Consult with the USACE about implementing a native emergent aquatic plant introduction pilot project. Plants collected from other Central Texas reservoirs (e.g. water willow (*Justicia americana*), bulrush (*Scirpus sp.*), and Illinois pondweed (*Potamogeton illinoensis*)) will be introduced. Only plants from reservoirs with no history of exotic plant infestations will be used for transplanting.
2. If the pilot project is successful (i.e. the plants spread beyond protective cages) seek funding for reservoir wide introductions of successfully introduced species.

ISSUE 4: Low-frequency electrofishing may be more effective than gillnets for blue catfish sampling.

MANAGEMENT STRATEGIES

1. Try low-frequency electrofishing in the fall of 2012 to compare to spring 2013 gillnetting.
2. If low-frequency electrofishing is more effective, use as a standard sampling method for blue catfish.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual trap net sampling and standard monitoring in 2012-2013 (Table 5). Annual trap net sampling is necessary to monitor the population dynamics of white crappie and to collect data for age and growth analyses. Gill net surveys are only necessary every four years to monitor catch rates of blue catfish, channel catfish, flathead catfish, and white bass. Electrofishing surveys are only necessary every four years to monitor catch rates of largemouth bass and prey species, and to acquire IOV data for gizzard shad.

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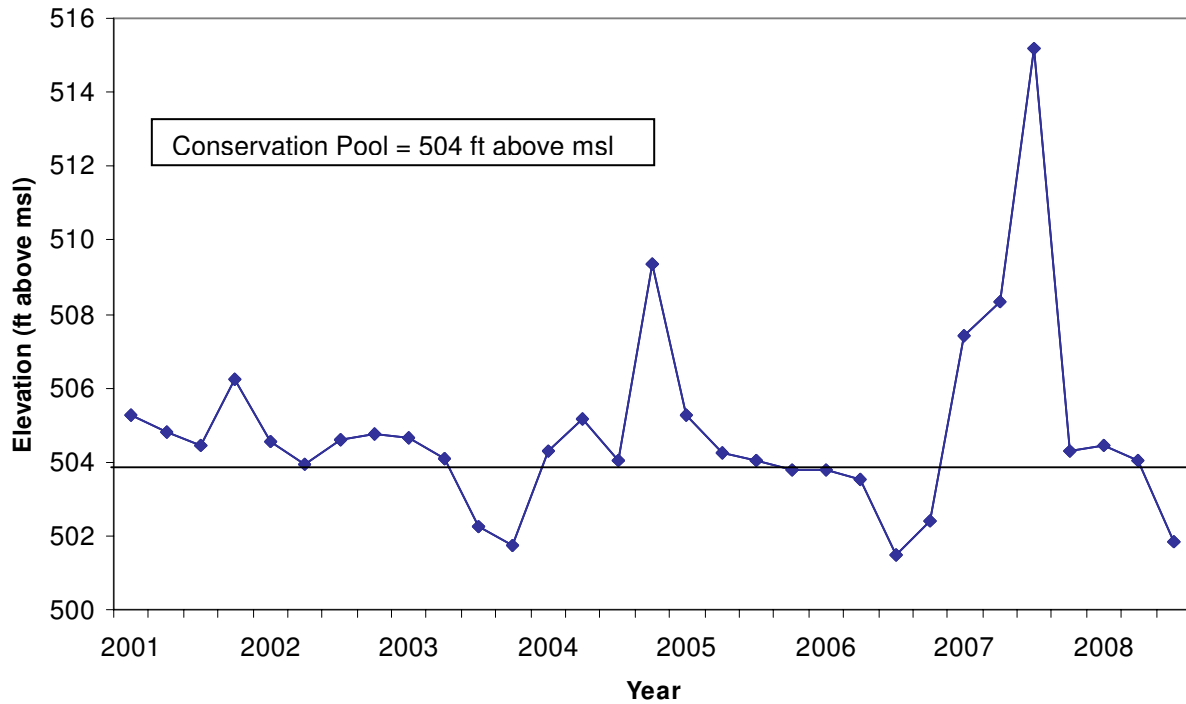


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Granger Reservoir, Texas.

Table 1. Characteristics of Granger Reservoir, Texas.

Characteristic	Description
Year Constructed	1980
Controlling authority	United States Army Corps of Engineers
County	Williamson
Reservoir type	Mainstream River System: San Gabriel
Shoreline Development Index (SDI)	4.3
Conductivity	450 umhos/cm

Table 2. Harvest regulations for Granger 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	14 – No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

Table 3. Stocking history of Granger Reservoir, 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.

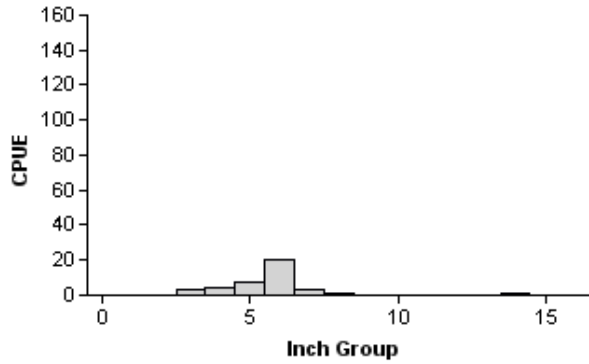
Species	Year	Number	Life Stage	Mean TL (in)
Blue catfish	1995	247,224	FGL	1.9
	1996	220,000	FGL	1.7
	Total	467,224		
Channel catfish	1979	31,860	AFGL	7.9
	1990	64,998	AFGL	4.0
	1996	220,429	FGL	1.8
	Total	317,287		
Coppernose bluegill	1981	100,000	UNK	UNK
	Total	100,000		
Florida largemouth bass	1980	50,584	FRY	1.0
	1992	44,470	FGL	1.1
	1992	175,696	FRY	0.9
	1994	220,976	FGL	1.3
	Total	491,726		
Striped bass	1981	110,371	UNK	UNK
	1983	15,927	UNK	UNK
	Total	126,298		

Table 4. Survey of littoral zone and physical habitat types, Granger Reservoir, Texas, 2008. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Eroded Bank	0.5	1.7		
Featureless	1.4	5.1		
Riprap	0.7	2.5		
Rocky Shoreline	0.4	1.3		
Vegetated Bank	13.3	47.2		
Vegetated Bank/Standing Timber	11.9	42.1		
Standing Timber			689.5	17.2
Water Hyacinth			0.3	0.01

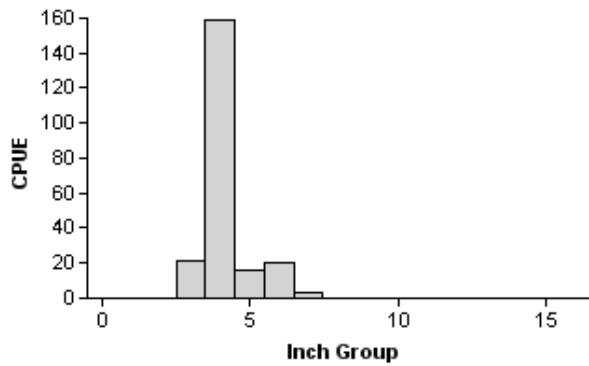
Gizzard Shad

2000



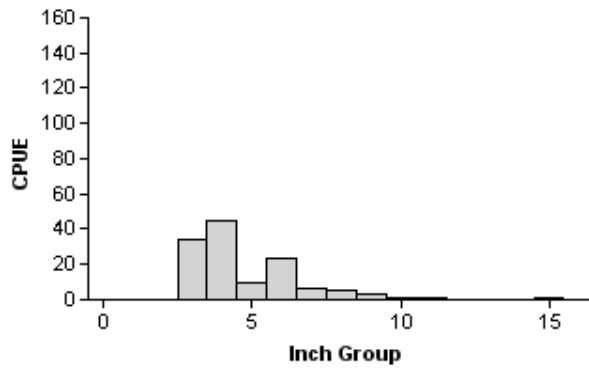
Effort = 0.9
 Total CPUE = 41.5 (42; 38)
 IOV = 94.7 (3.8)

2004



Effort = 1.0
 Total CPUE = 219.0 (31; 219)
 IOV = 100.0 (0.0)

2008

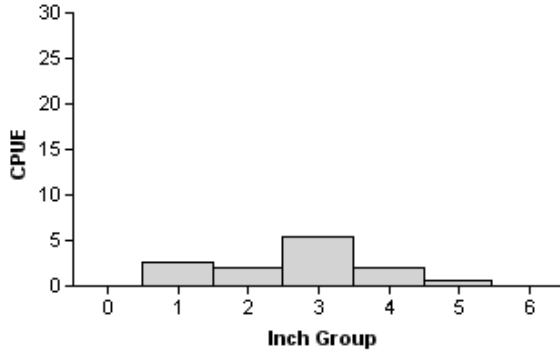


Effort = 1.0
 Total CPUE = 129.0 (14; 129)
 IOV = 91.5 (4.3)

Figure 2. Number of gizzard shad caught per hour (CPUE) population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Granger Reservoir, Texas, 2000, 2004 and 2008.

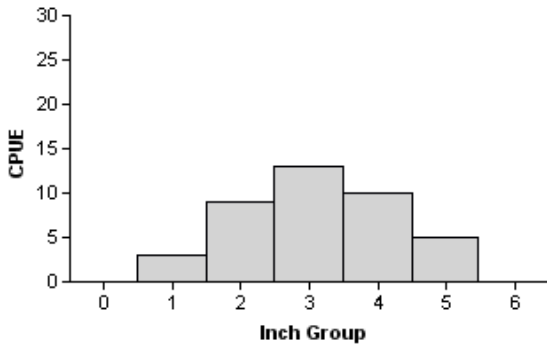
Bluegill

1997



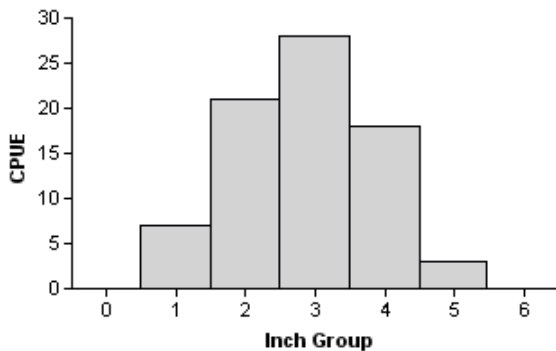
Effort = 1.5
 Total CPUE = 12.7 (42; 19)
 PSD = 0 (76.2)

2004



Effort = 1.0
 Total CPUE = 40.0 (33; 40)
 PSD = 0 (64.0)

2008



Effort = 1.0
 Total CPUE = 77.0 (30; 77)
 PSD = 0 (66.9)

Figure 3. Number of bluegill caught per hour (CPUE) population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Granger Reservoir, Texas, 1997, 2004 and 2008. A survey was conducted in 2000, but no bluegill were collected.

Blue Catfish

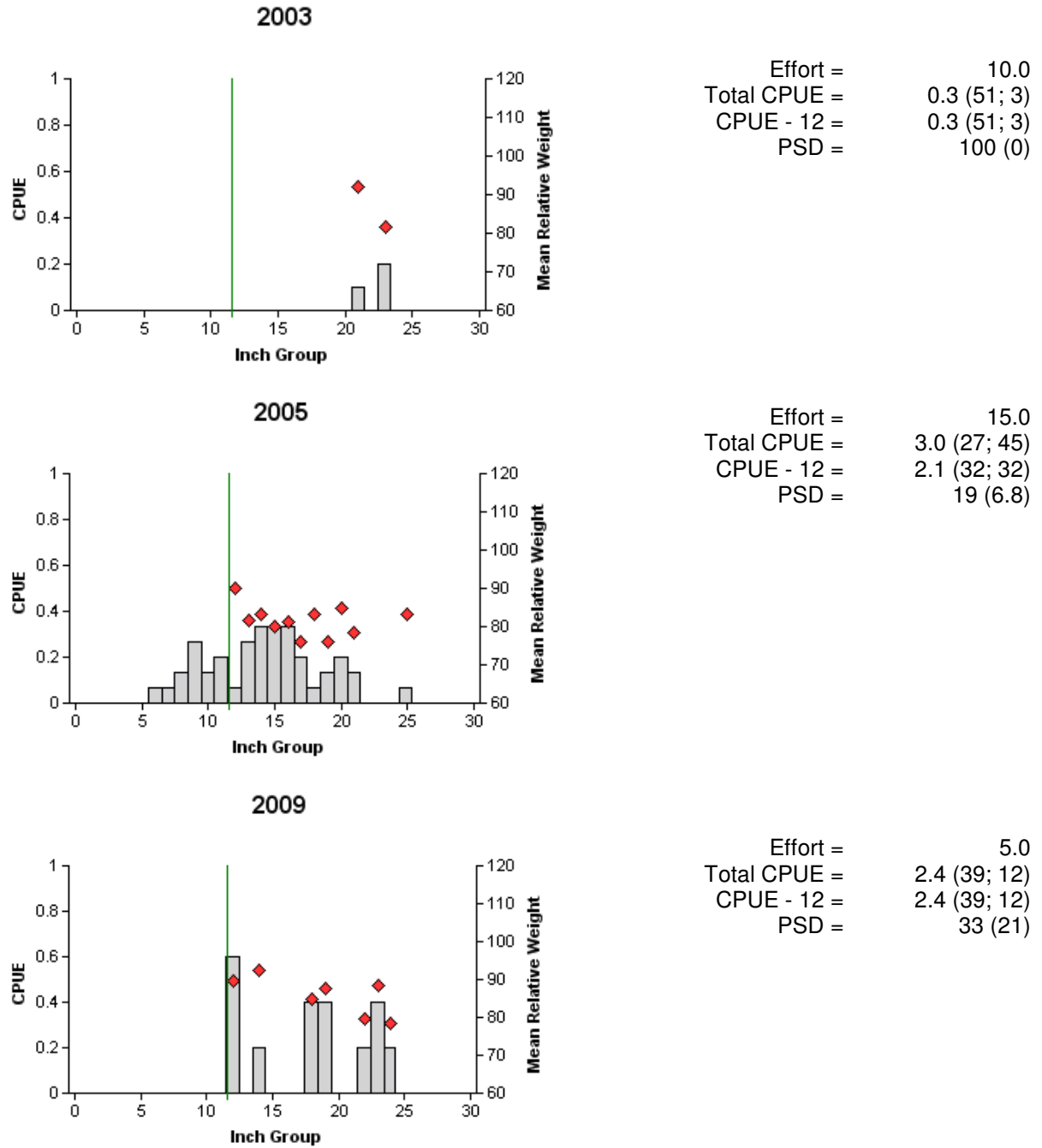


Figure 4. Number of blue catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granger Reservoir, Texas, 2003, 2005 and 2009. Minimum length limit indicated by vertical line.

Blue Catfish

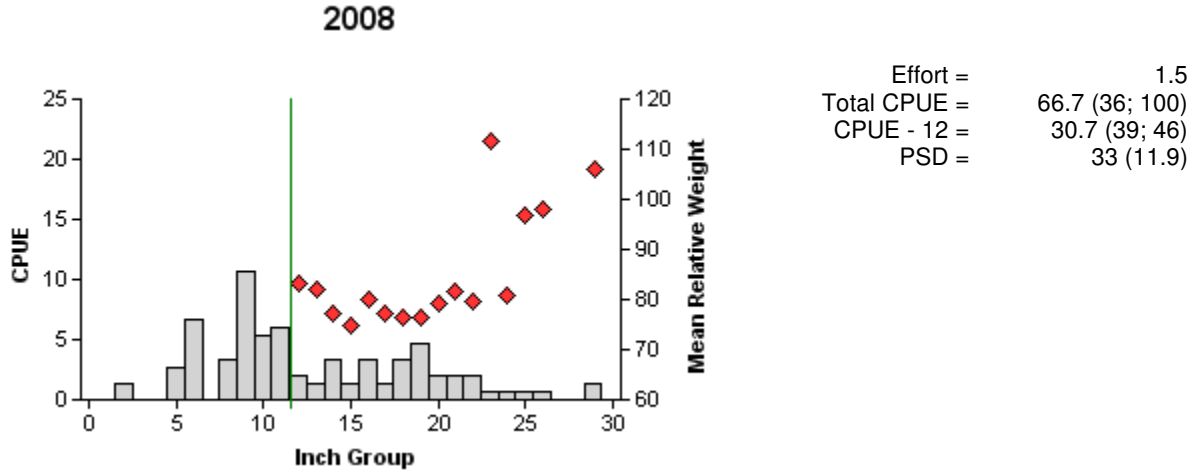


Figure 5. Number of blue catfish caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for low - frequency summer electrofishing, Granger Reservoir, Texas, 2008. Minimum length limit indicated by vertical line.

Channel Catfish

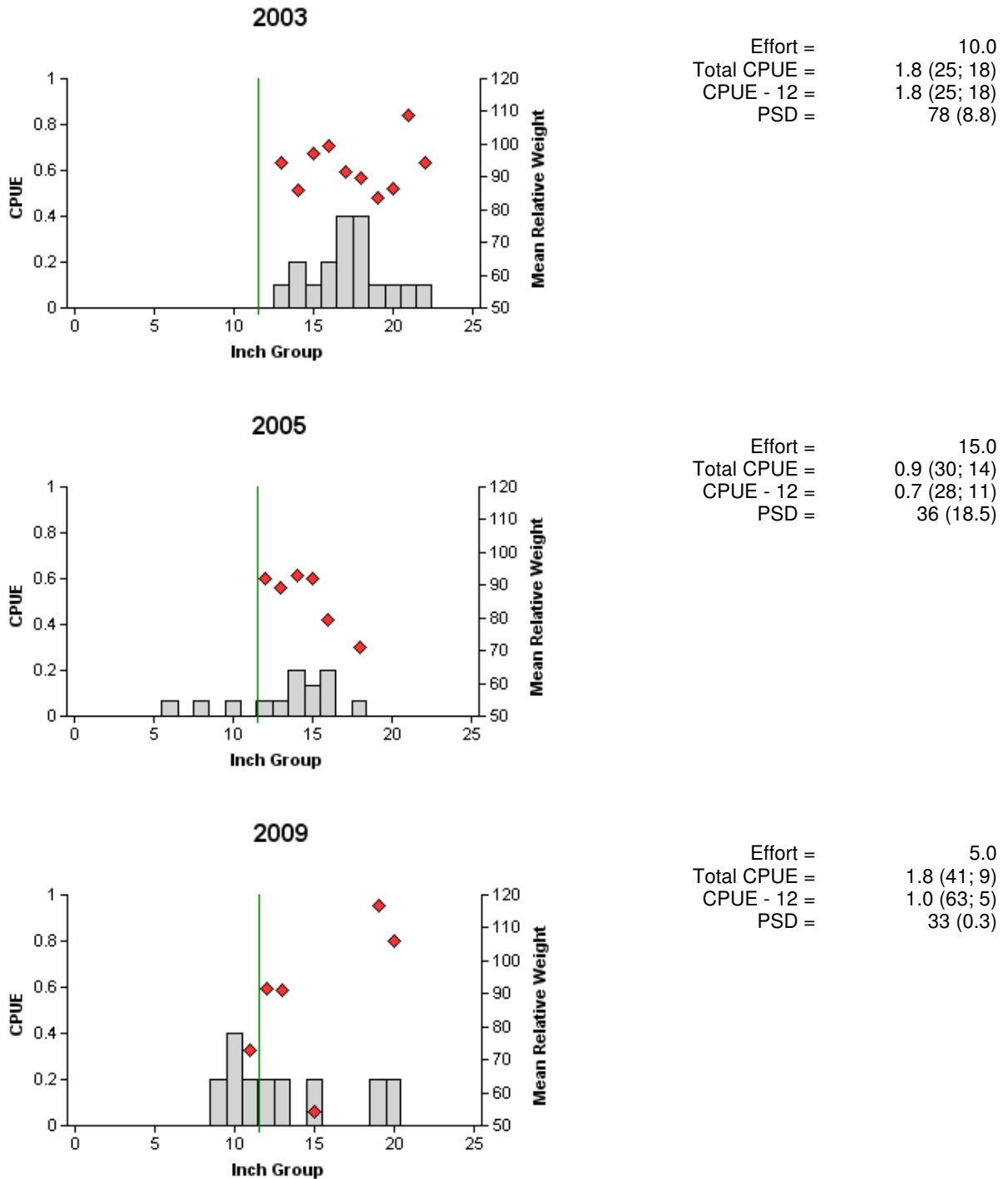


Figure 6. Number of channel catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granger Reservoir, Texas, 2003, 2005 and 2009. Minimum length limit indicated by vertical line.

Flathead Catfish

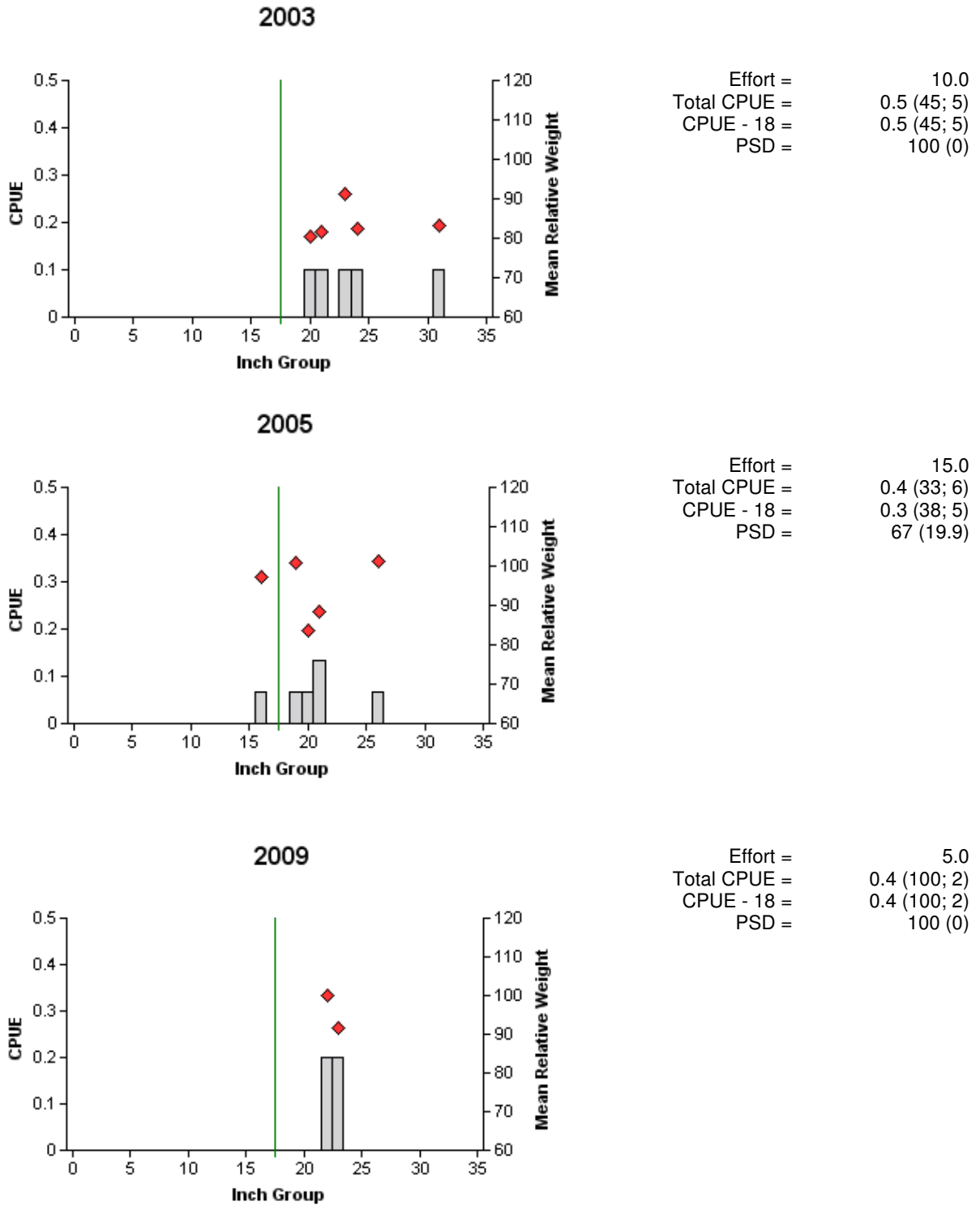


Figure 7. Number of flathead catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granger Reservoir, Texas, 2003, 2005 and 2009. Minimum length limit indicated by vertical line.

White Bass

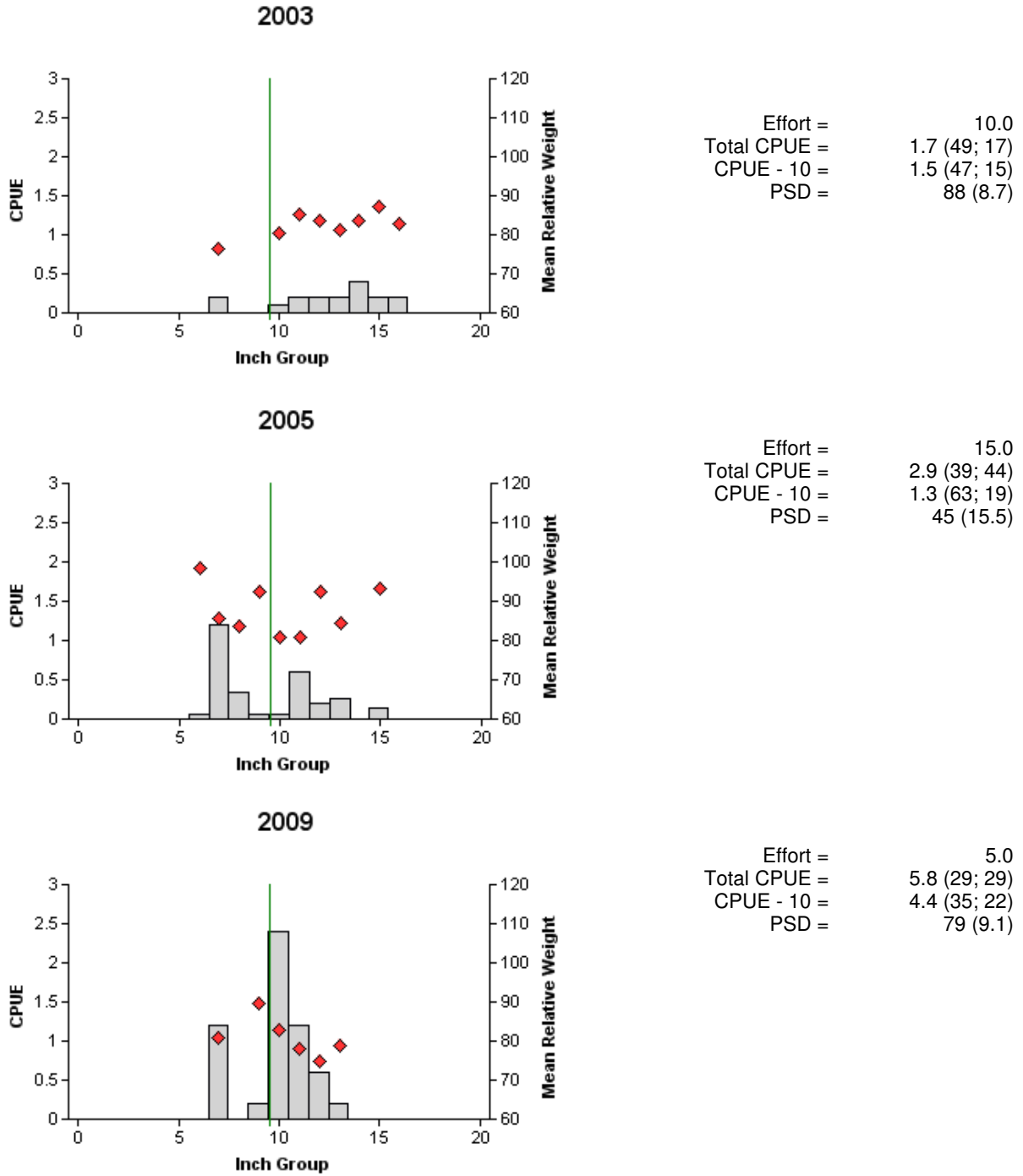


Figure 8. Number of white bass caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granger Reservoir, Texas, 2003, 2005 and 2009. Minimum length limit indicated by vertical line.

Largemouth Bass

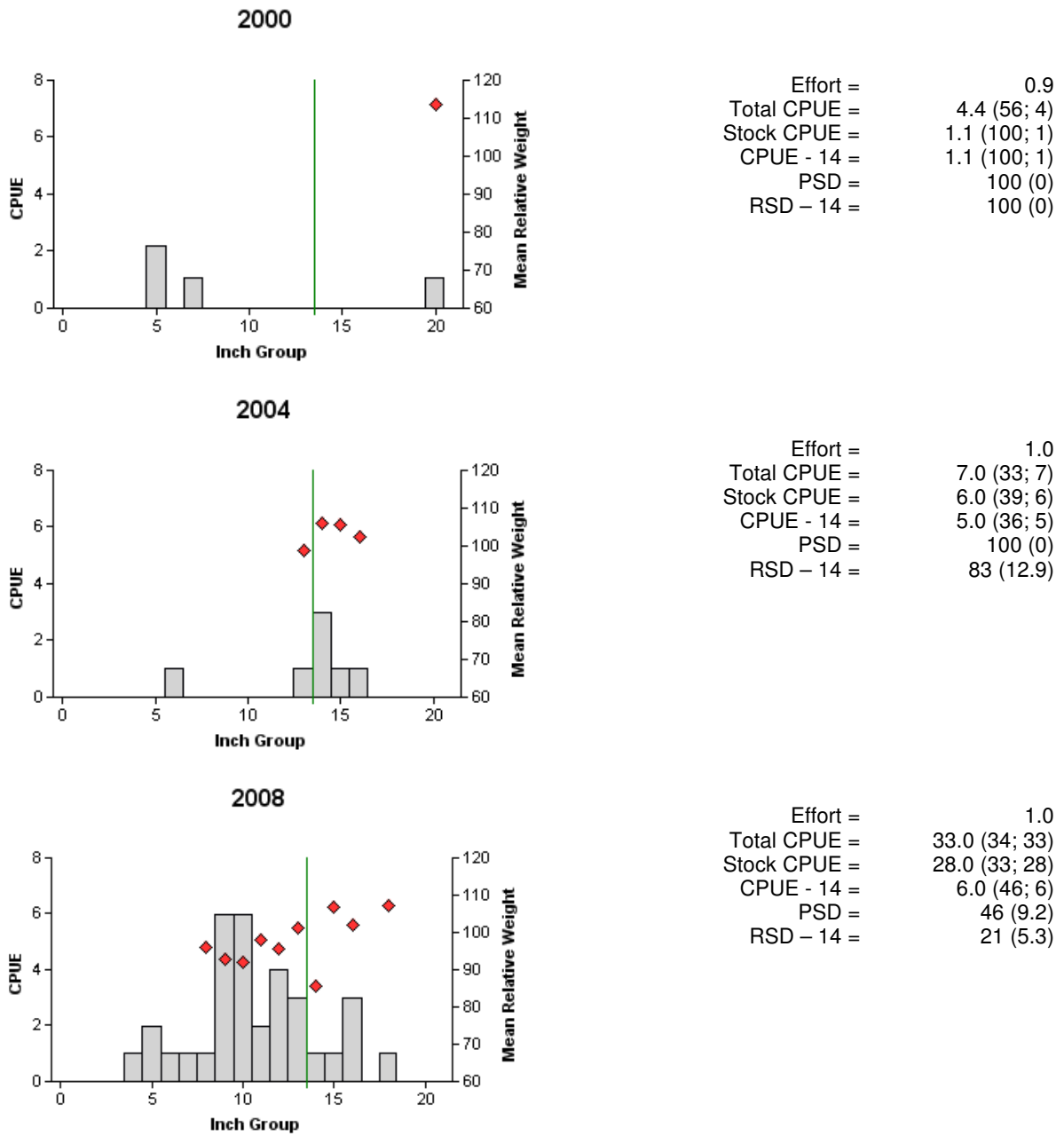


Figure 9. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Granger Reservoir, Texas, 2000, 2004 and 2008. Minimum length limit indicated by vertical line.

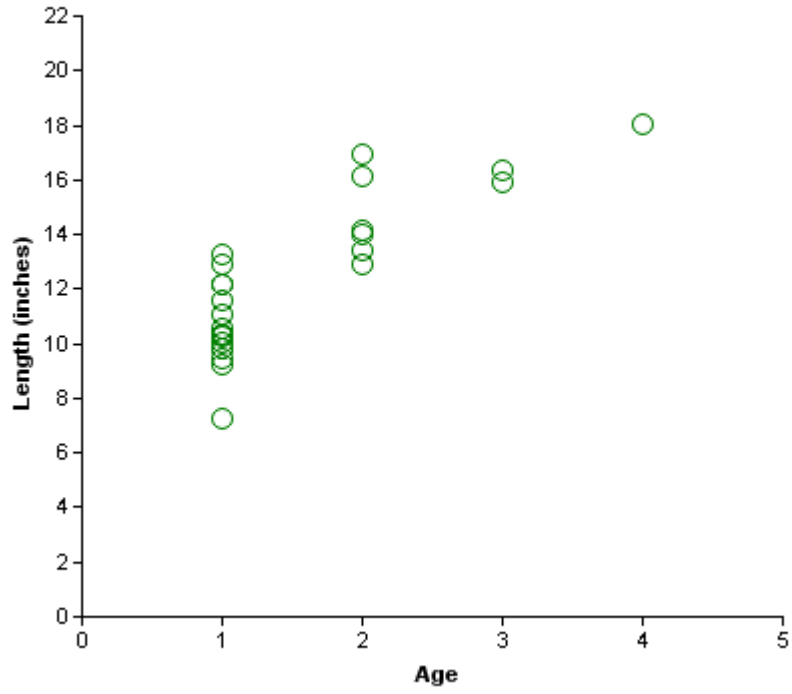


Figure 10. Length at age for largemouth bass collected by electrofishing at Granger Reservoir, Texas, November 2008 (N = 25; range = 1-4 years).

White Crappie

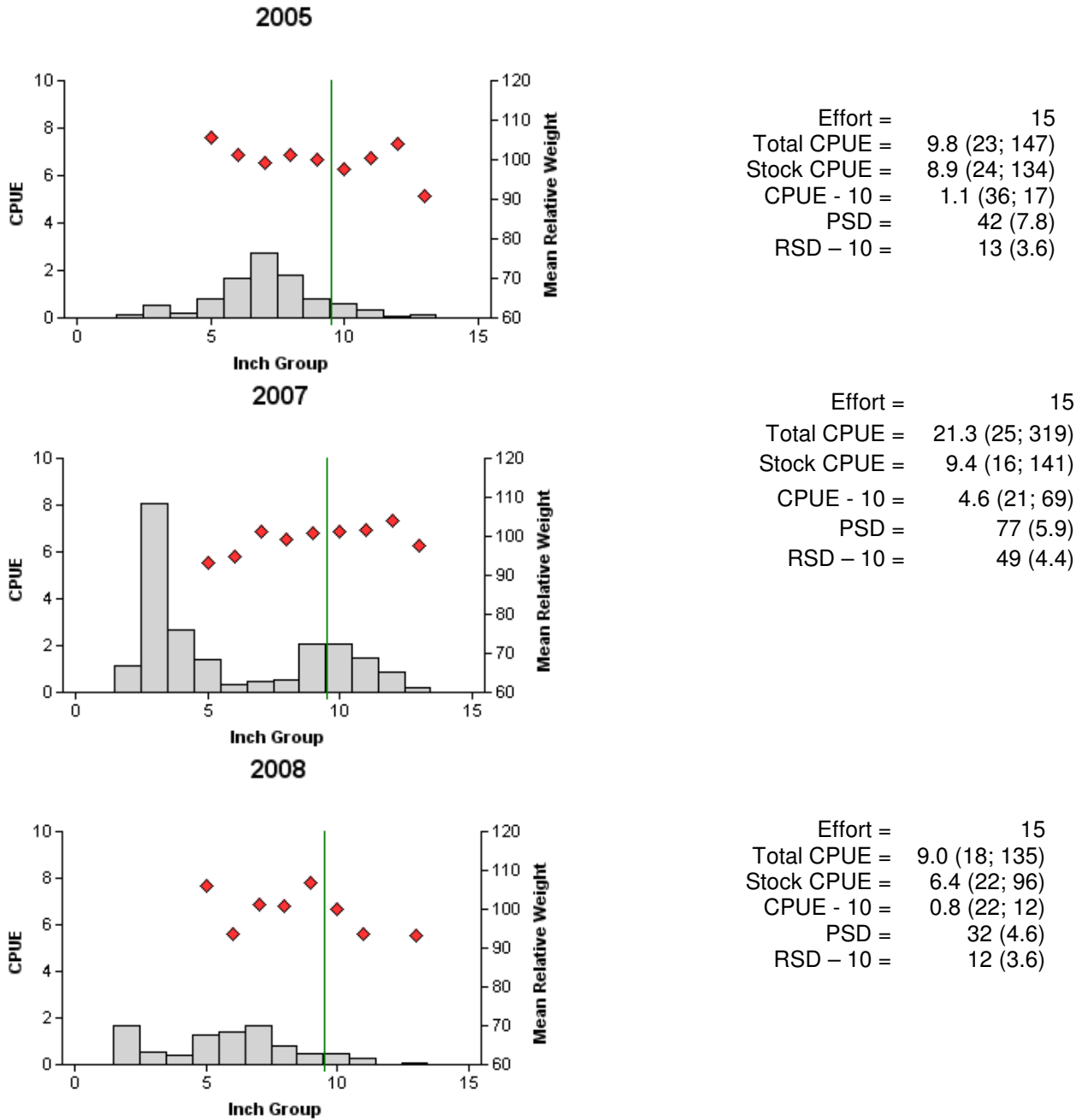


Figure 11. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Granger Reservoir, Texas, 2005, 2007 and 2008. Minimum length limit indicated by vertical line.

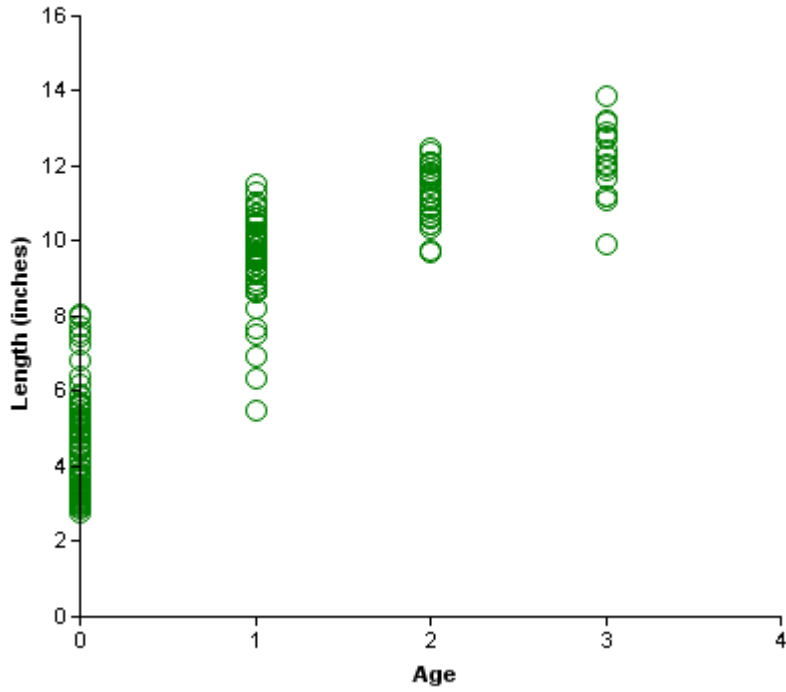


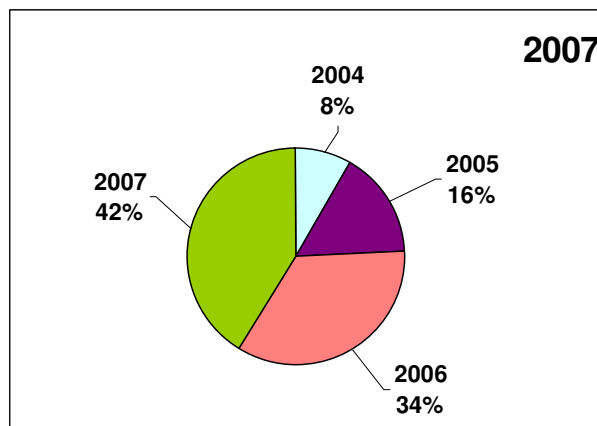
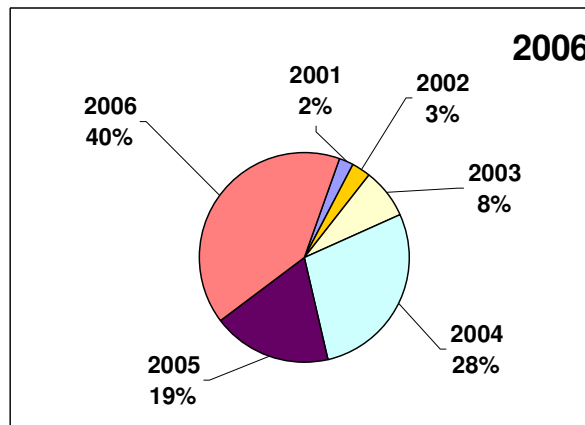
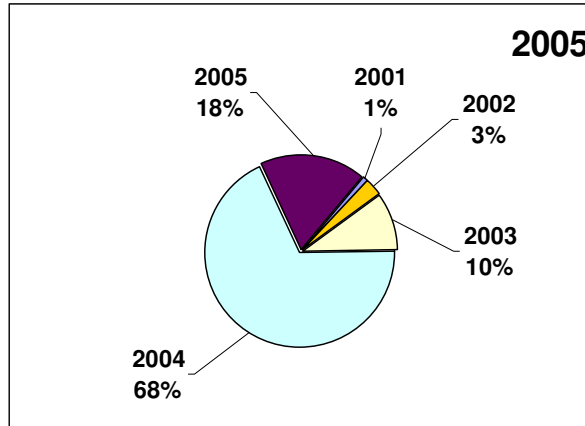
Figure 12. Length at age for white crappie collected by trap netting at Granger, Reservoir, Texas, December 2007 (N = 191, range 0-3 years).

Table 5. Proposed sampling schedule for Granger 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 2009-Spring 2010		A			
Fall 2010-Spring 2011		A			
Fall 2011-Spring 2012		A			
Fall 2012-Spring 2013	S	S	S		S

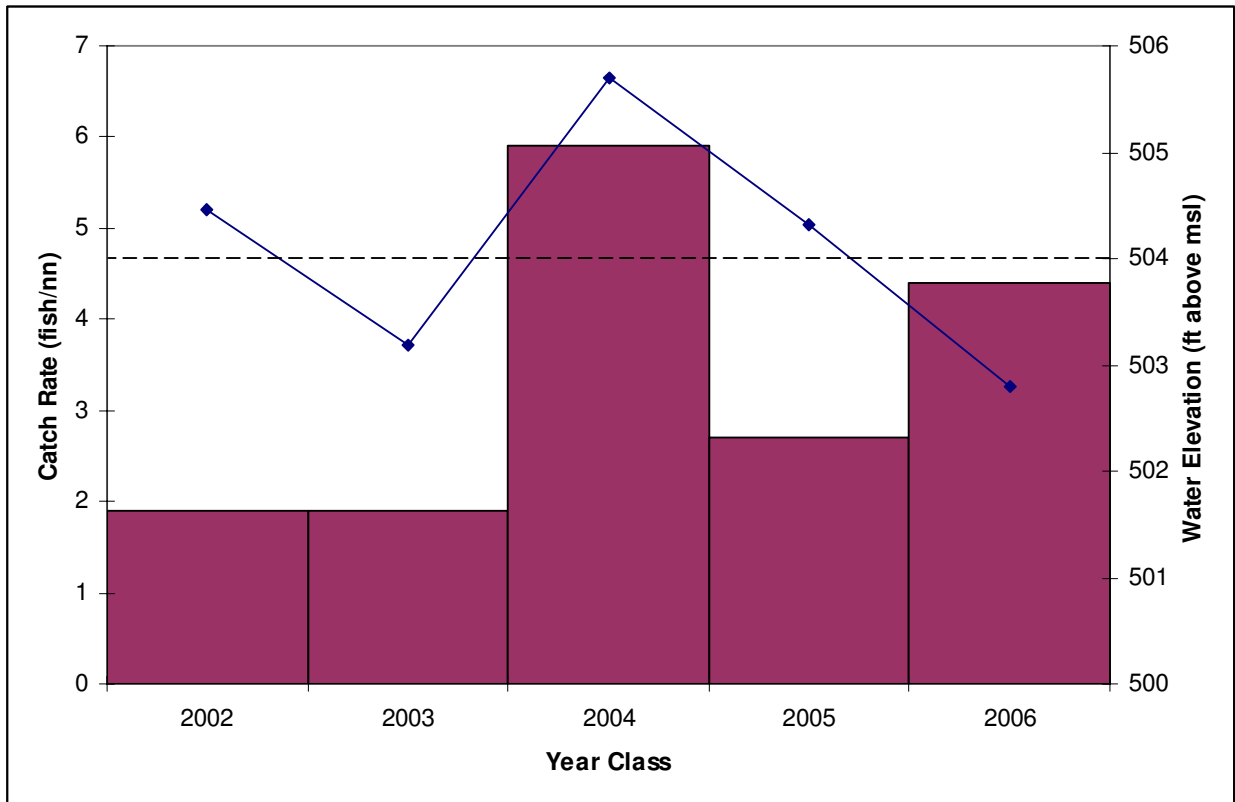
APPENDIX A

Percentage of white crappie year classes collected by trap netting Granger Reservoir, Texas, 2005, 2006, and 2007. Data from 2006 are derived from tandem trap netting.



APPENDIX B

Comparison of white crappie year class abundance (bars) to mean annual water elevation (diamonds) in Granger Reservoir, Texas. Year class abundance is represented by age-1 catch rates during trap net surveys conducted the following year (2003 through 2007). A dashed horizontal line represents the conservation pool of Granger Reservoir (504 ft above msl).

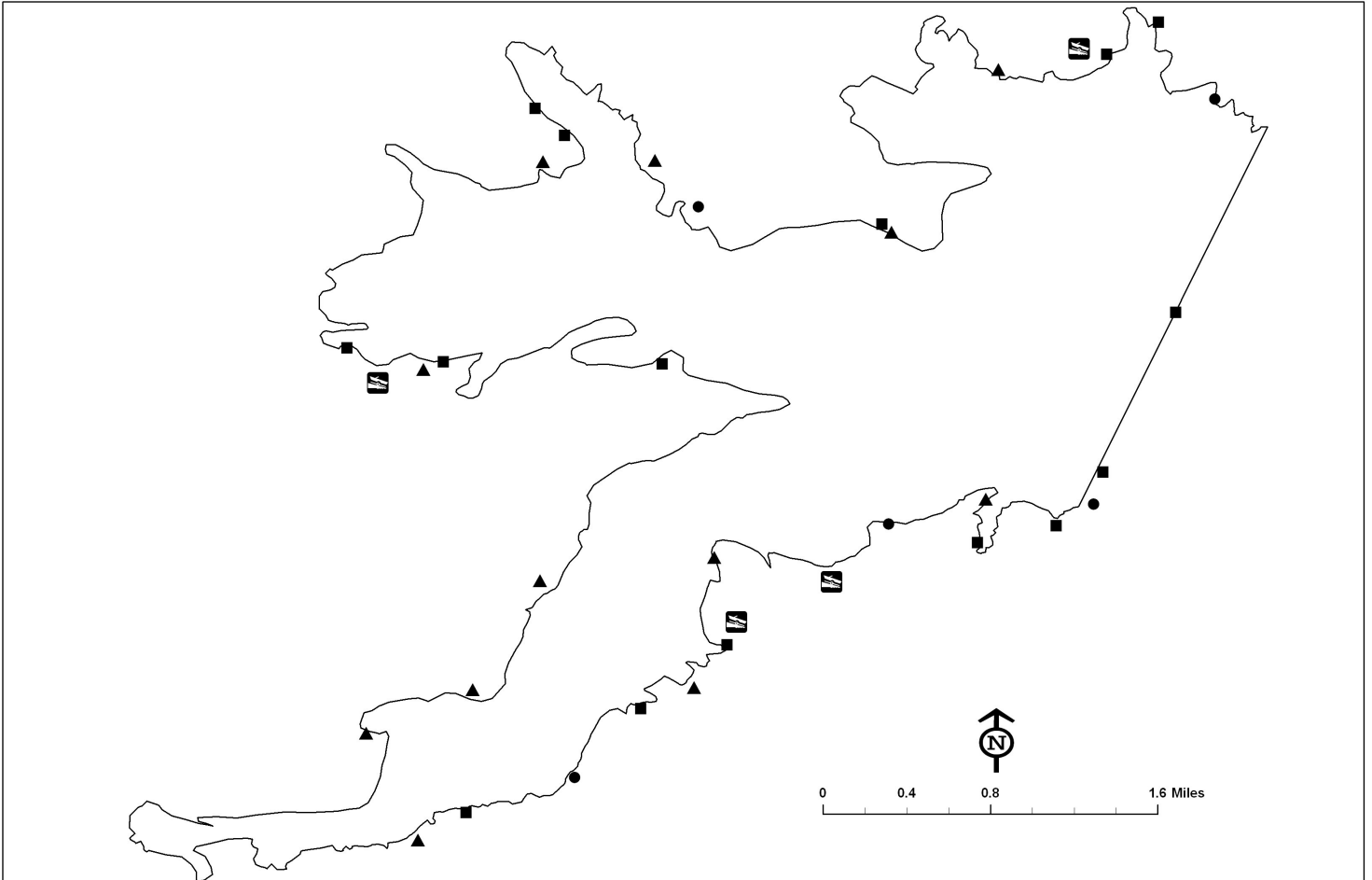


APPENDIX C

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Granger Reservoir, Texas, 2008-2009.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					129	129.0
Threadfin shad					62	62.0
Channel catfish	9	1.8				
Flathead catfish	2	0.4				
Blue catfish	12	2.4				
White bass	29	5.8				
Warmouth					9	9.0
Bluegill					77	77.0
Longear sunfish					20	20.0
Redear sunfish					2	2.0
Largemouth bass					33	33.0
White crappie			135	9.0		

APPENDIX D



Location of sampling sites, Granger Reservoir, Texas, 2008-2009. Trap net, gill net, and electrofishing stations are indicated by squares, circles, and triangles respectively. Boat ramps are indicated by the boat ramp symbol (☐).