PERFORMANCE REPORT

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STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

Sam Rayburn Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Sam Rayburn Reservoir were surveyed in 2008 using electrofishing and in 2009 using gill netting. Anglers were surveyed from June 2008 through May 2009 with a creel survey. This report summarizes the results of the surveys and contains a management plan for the reservoir.

- **Reservoir description:** Sam Rayburn Reservoir is an 111,422-acre impoundment of the Angelina River in Jasper, Tyler, Angelina, Nacogdoches, San Augustine, and Sabine counties in southeast Texas. Water level fluctuations average 6.7 feet annually. Aquatic habitat consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber.

- **Management history:** The black bass fishery is the most popular at Sam Rayburn Reservoir (65 - 80% of annual angling effort, which includes over 400 bass tournaments per year). Approximately 10 - 20% of anglers target crappie and 4 - 8% target catfish. Angler interest in more restrictive length limits for largemouth bass and potential biological and economic impacts of bass tournaments prompted research in 2004 - 2009. Results indicated that the proportion of the largemouth bass population harvested was relatively low (9%) and more restrictive length limits would provide little benefit. In addition, impacts of tournaments on the largemouth bass population were low (only 5% of population retained by tournament anglers) but tournament expenditures were high (73% of total). Florida largemouth bass (FLMB) have been stocked annually since 1994 to increase abundance of large bass (>8 pounds). In 2008, giant salvinia was found in the reservoir. Numerous introductions via boat trailers have occurred. Most plants have been removed, but giant salvinia persists in two locations (<5 total acres) and additional spread is likely.

- **Fish community**
  - **Prey species:** Gizzard shad, threadfin shad, and bluegill were the most abundant prey species and provided ample forage for sport fish**.**

  - **Catfishes:** The relative abundance of blue and channel catfish was stable compared to previous years. Angler catch rates averaged 2.9/hour. Blue and flathead catfish provided trophy opportunities for anglers.

  - **Temperate basses:** White bass were present in the reservoir but numbers were low. Palmetto bass stockings were discontinued after 2000 and few fish remain. During the last two survey years, no anglers targeted temperate bass.

  - **Black basses:** Spotted bass were present in low numbers. Largemouth bass abundance was high compared to previous years, and size structure and fish condition were favorable. The black bass fishery was most popular (68.9% of anglers targeted bass). The angler catch rate was high (1.1/hour).

  - **Crappie:** White and black crappie were present in the reservoir. Angler catch (1.5/hour) and total annual harvest (99,087 fish) reflected an abundant crappie population.

- **Management strategies:** Stock FLMB annually to maintain and improve large fish abundance. Monitor largemouth bass population annually with electrofishing and creel surveys. Continue tournament monitoring program to more effectively monitor larger fish abundance. Maintain information signs, conduct annual aerial vegetation surveys, and apply herbicides when appropriate to minimize impacts of giant salvinia. Monitor the crappie fishery via annual creel surveys. Publish results of economic impact research. Monitor the catfish populations with annual creel surveys and gill net surveys every two years. Publish monthly articles in the Lakecaster highlighting TPWD activities.

INTRODUCTION

This document is a summary of fisheries data collected from Sam Rayburn Reservoir from June 2008 through May 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

Sam Rayburn Reservoir is an impoundment of Angelina River in Jasper, Tyler, Angelina, Nacogdoches, San Augustine, and Sabine counties in southeast Texas. The U.S. Army Corps of Engineers (USACE) constructed the reservoir in 1965 for flood control, generation of hydroelectric power, and for municipal, industrial, agricultural, and recreational uses. At conservation pool, Sam Rayburn Reservoir is 111,422 surface acres, has a shoreline length of 750 miles, and a mean depth of 20 feet. Water level fluctuations average 6.7 feet annually (Figure 1). The reservoir was mesotrophic with a mean Trophic State Index chl-*a* of 55.9 (Angelina and Neches River Authority, unpublished data). Angler and boat access was excellent with 24 boat ramps present. Habitat at time of sampling consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber. Most of the land around the reservoir is used for timber production and agriculture. Other descriptive characteristics for Sam Rayburn Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Driscoll and Ashe 2007) included:

1. Stock Florida largemouth bass (FLMB) annually (100 fingerlings/acre) in 5,000-acre embayment until pure FLMB constitute > 20% of the population within embayment.
   Action: From 2000 - 2002, FLMB were stocked annually in the Caney Creek embayment. The FLMB genotype in Caney Creek was 33% in 2002 (Appendix D). Annual FLMB stockings were conducted in the Ayish Bayou embayment from 2003 - 2008. Ayish Bayou FLMB genotypes were 23% in 2007 (Appendix D). In 2009, embayment stockings were discontinued, and fish were stocked throughout the reservoir.
2. Conduct annual electrofishing and creel surveys to monitor status of largemouth bass population and examine growth every four years.
   Action: Surveys were conducted from 2007 - 2009 and indicated relatively stable and good population abundance and angling success. Growth was examined in 2006.
3. Continue black bass tournament-monitoring program to increase information on relative abundance of large fish (> 20 inches).
   Action: Since 2007, data from 65 tournaments were entered and summarized in Appendix C.
5. Conduct annual vegetation surveys to monitor hydrilla abundance and prevent establishment of giant salvinia.
   Action: Numerous surveys were conducted from 2007 - 2009. Hydrilla coverage increased to 10,185 surface acres (9% of reservoir surface area). In 2008, giant salvinia was found in the reservoir. Numerous introductions at access points have been eradicated by manual plant removal from both the reservoir and boat trailers. The largest infestation (Coleman Creek) has been contained with booms to prevent spread throughout the reservoir. Manual removal and herbicide treatments have been conducted inside booms.
6. Conduct gillnetting surveys every two years to monitor the status of catfish populations and examine growth every four years to ensure the 12-inch minimum length limit is appropriate.
   Action: Surveys were conducted in 2007 and 2009. Growth was examined in 2007.

7. Conduct economic research estimating the annual number of black bass tournaments, and the annual direct expenditures and recreational value of both tournament and non-tournament angling.
   Action: Research was initiated in November 2007. The final report should be complete by July 2009.
8. Publish monthly popular articles in the Lakecaster, a newsletter distributed to 30 counties in Texas and Louisiana.
   Action: Articles highlighting TPWD activities at Sam Rayburn Reservoir have been published monthly since 2000.

Harvest regulation history: Historically, all sport fishes in Sam Rayburn Reservoir have been managed with statewide regulations (Table 2).

Stocking history: Since 1994, Sam Rayburn Reservoir has received annual stockings of FLMB (Table 3). From 2000 - 2008, FLMB were stocked in 5,000-acre embayments (Caney Creek or Ayish Bayou) at a rate of 100 fingerlings/acre to maximize stocking influence. The Caney Creek embayment was stocked from 2000 - 2002. Embayment sampling during the fall of 2002 indicated that the FLMB genotype was 33%, which exceeded the embayment goal of 20% (Appendix D). The Ayish Bayou embayment was selected for stocking in 2003 - 2008. FLMB genotypes were 23% in 2007 (Appendix D). Embayment stockings were discontinued in 2009. From 1991 - 2000, palmetto bass were stocked annually. Stockings were discontinued after 2000 due to low directed angler effort and harvest. The complete stocking history is in Table 3.

Vegetation/habitat history: Historically, aquatic vegetation coverage at Sam Rayburn Reservoir (primarily hydrilla) has approached 20,000 surface acres and included over 25 plant species. Since 2000, aquatic vegetation coverage has ranged from 5,415 (2004) to 14,695 surface acres (2000). Since 2004, hydrilla coverage has increased from 2,944 to 10,185 surface acres (Table 4). Although hydrilla is an exotic, invasive species and is listed on the TPWD list of prohibitive plants, hydrilla is considered beneficial habitat at Sam Rayburn Reservoir, as coverage has never been problematic or caused access problems. Nuisance exotic species include common salvinia, giant salvinia, and water hyacinth. Common salvinia and water hyacinth have persisted in shallow backwaters of creeks and embayments and caused few problems. Giant salvinia was found in 2008. Although numerous introductions via boat trailers have been manually removed, giant salvinia persists in two locations (<5 total acres) and additional spread is likely.

METHODS

Fishes were collected by electrofishing (2 hours at 24, 5-min stations during October) and gill netting (15 net nights at 15 stations during February). 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 nets as the number of fish per net night (fish/nn). All survey sites were randomly selected and surveys conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (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. Water level data were obtained from the USACE website.

A roving creel survey (36 days; 9 days per quarter) was conducted from June 2008 through May 2009 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Total angler catch of largemouth bass $\geq$ 4, 7, and

10 pounds was also estimated. Anglers were asked if released fish were within weight categories. Harvested fish lengths were converted to weights for classification (19 inches = 4 pounds; 23 inches = 7 pounds; 25 inches = 10 pounds).

An aquatic vegetation survey was conducted in 2008 via an aerial flight. Coverages were calculated for all prevalent species.

Results of largemouth bass tournaments used to supplement population information collected from electrofishing and creel surveys are included in Appendix C.

RESULTS AND DISCUSSION

Habitat: A habitat survey conducted in 2002 indicated the littoral zone included primarily indescript bank, overhanging brush, and dead timber (Driscoll and Parks 2003). Approximately 24,000 acres of standing timber were present. In 2008, beneficial aquatic vegetation (primarily hydrilla and American lotus) increased considerably (Table 4). Giant salvinia was discovered in 2008. Floating booms were erected in an effort to contain and eradicate it. Since giant salvinia was first discovered it has been introduced to the reservoir via boat trailers and now persists in two known locations and is likely to spread to other areas of the reservoir.

Creel: Similar to previous survey years, fishing effort at Sam Rayburn Reservoir was primarily directed at black basses (68.9%) and crappies (13.7%) (Table 5). Total fishing effort for all species was 483,465 hours; lower than in previous years (Table 6). Total directed expenditures ($5,066,837) also declined. However, these expenditures estimated from creel surveys were much lower than total annual expenditures derived from the economic research ($32,259,314.85).

Prey species: Primary prey species included gizzard shad, threadfin shad, and bluegill. Gizzard shad catch rates were low from 2006 through 2008 (range=19.5–33.5/h) (Figure 2). In 2008, a majority were available as prey (IOV = 83). Historically, threadfin shad catch rates have been highly variable and are probably not reflective of population status. The catch rate in 2008 was 648.0/h (Appendix A). During the last three survey years, bluegill catch rates ranged from 160.5/h (2006) to 575.5/h (2007). Prey species abundance was adequate, as relative weights of sport fish were within desired ranges. Few anglers target sunfish (<1% of total fishing effort) (Table 7).

Catfish: Since 2005, blue catfish recruitment has been relatively steady. Catch rates ranged from 4.3-6.0/nn (Figure 5). Although few blue catfish >25 inches were collected, anecdotal information indicates passive gear anglers frequently catch fish >30 pounds. Channel catfish recruitment also appeared steady, as catch rates ranged from 2.5 (2005) to 6.4/nn (2007) (Figure 6). Catch rates of large fish (>15 inches) increased in 2009.

Directed rod and reel angler effort and catch rates of catfishes were similar from 2006 to 2009 (Table 8). Catfish anglers accounted for 7-12% of the total fishing effort during the three survey years. Total estimated harvest was 112,485 fish in 2008/2009; 96% of harvested fish were channel catfish (Figure 8).

White and palmetto bass: Gill net data indicated population density of white bass in the reservoir was relatively low. During the last three survey years, catch rates were $\leq$1.5/nn (Figure 9). From 1995 through 2000, palmetto bass fingerlings were stocked annually at low rates (~ 5/acre), but no fish have been stocked since 2000. As expected, catch rates were low during the last three survey years ($\leq$1.2/nn; Figure 10). During the last two survey years, no fishing effort was directed at temperate basses (Table 9).

Black bass: Historically, electrofishing catch rates of spotted bass have been low. Catch rates were <13.0/h during 2006 through 2008 (Figure 13). Few spotted bass >10 inches were collected. Estimated

angler harvest was 6,199 fish in 2008/2009 (Figure 15).

Fall electrofishing catch rates from 2006 through 2008 reflected relatively high largemouth bass recruitment rates (range = 151.0 - 293.0/h; Figure 14). Population size structure was similar across years (PSD range = 41 - 60; RSD-14 range = 16 – 28). Relative weights ranged from 83–110, indicating largemouth bass were in good condition.

Although the reservoir has been stocked with FLMB annually since 1994 (Table 3), reservoir-wide FLMB influence has remained low and relatively stable. From 2000 - 2008, FLMB were stocked at rates of 100 fish/acre in selected embayments (Caney Creek and Ayish Bayou) to increase stocking influence (i.e., achieve $\geq$ 20% pure FLMB). Caney Creek received annual FLMB stockings during 2000 – 2002 and genetic analysis in 2002 revealed 32.5% pure FLMB, compared to 5.8% in the reservoir (Appendix D). In 2003 and 2004, Caney Creek maintained levels of pure FLMB without stockings (25.0% and 34.0%, respectively). However, pure FLMB steadily declined to 6.7% in 2007. The Ayish Bayou embayment received stockings in 2003 – 2008. Genetic analysis in 2007 revealed a substantial increase of FLMB genotypes (23.3%) (Appendix D).

The black bass fishery accounted for the majority of annual fishing effort (68.9%; Table 5). Creel surveys indicated that catch and harvest rates were similar from 2006 – 2009 (Table 10). Total directed effort decreased in 2008/2009. Total harvested numbers of largemouth bass were similar from 2006 -2009, with the majority of fish ranging from 14 – 16 inches in length (Figure 16). Tournament-retained fish accounted for 67% of harvest. Total annual catch of largemouth bass $\geq$ four pounds ranged from 12,578 – 19,459 fish.

A tournament-monitoring program was implemented in June 2003 to increase information on fish $\geq$ 14 inches and provide greater insight regarding large (> 20 inches) fish abundance (Appendix C). Overall, most tournament variables were remarkably similar across years. The percent of anglers catching 5-fish limits was over 50% for a majority of years, indicating high and stable numbers of fish $\geq$ 14 inches. Average big bass weight was >8 pounds for all but one year, and average weight to win events ranged from 20.2 – 24.3 pounds, reflecting relatively high and stable numbers of large fish. Similarly, results of Sealy Outdoors McDonald's Big Bass Splash tournaments also suggested high and stable numbers of large bass.

Crappie: Although creel data indicated the crappie fishery was second only to the black bass fishery in terms of total fishing effort (13.7%; Table 5), total hours of directed effort, total catch rate, and total harvest have declined (Table 12). Since 2006, directed effort declined 43% and total harvest declined 56%.

Fisheries management plan for Sam Rayburn Reservoir, Texas

Prepared – July 2009

ISSUE 1: Creel surveys indicate most sportfishing effort at Sam Rayburn Reservoir is for largemouth bass. The economic contribution of the largemouth bass fishery to the local area is high, as the total economic value of the recreational fishery was estimated at $46.6 million. The reservoir also hosts over 400 bass tournaments per year with an economic value of $30.5 million (TPWD, unpublished data). The reservoir has also demonstrated the potential for producing trophy fish.

MANAGEMENT STRATEGIES

1. Continue annual stocking of FLMB to maintain and improve the trophy largemouth bass population, but discontinue embayment stockings. The objective of embayment stockings was to demonstrate measurable results of a more intensive stocking rate (100/acre stocked in a 5,000-acre area). Results were achieved in two embayments. Future stockings will be reservoir-wide.
2. Continue the tournament monitoring program to increase information on fish $\geq$ 14 inches.
3. Conduct annual electrofishing and creel surveys to monitor status of largemouth bass population.
4. Examine largemouth bass growth every four years.
5. Continue to promote fish handling procedures that minimize tournament-related mortality to minimize impacts on largemouth bass population and reduce conflicts with non-tournament anglers.

ISSUE 2: In 2008, giant salvinia was found in Sam Rayburn Reservoir. Although numerous introductions via boat trailers were confined and removed, plants persist in several areas (< 5 acres total coverage).

MANAGEMENT STRATEGIES

1. Maintain all educational signs posted at Sam Rayburn Reservoir to minimize effects and potential transport to other waters.
2. Utilize all available control methods (i.e., containment booms, manual removal, herbicides, and salvinia weevils) when applicable to minimize coverage and related effects.
3. Conduct biannual, reservoir-wide aerial flight surveys and monthly supplemental surveys adjacent to access points by boat to monitor for giant salvinia coverage.

ISSUE 3: Historically, the crappie fishery at Sam Rayburn Reservoir was productive and popular. Directed effort and harvest has exceeded 3.0 h/acre and 400,000 fish, respectively. In 2008 – 2009, directed effort was 0.6 h/acre and total harvest was < 100,000 fish.

MANAGEMENT STRATEGY

1. Conduct annual creel surveys to monitor the crappie fishery, as trap netting at Sam Rayburn Reservoir is not effective.

ISSUE 4: Due to rising demands for water, discussions regarding East Texas water use prioritization and interbasin transfer are increasing. To ensure that recreational fishing is appropriately considered, regulatory agencies must be informed of the economic contributions of Sam Rayburn Reservoir anglers.

MANAGEMENT STRATEGY

1. Complete final report related to November 2007 – October 2008 economic research and publish results in a peer-reviewed journal.

ISSUE 5: A considerable catfish fishery also exists. Although the rod and reel catfish fishery is negligible, the majority of the actual directed catfish effort is likely due to passive gear anglers.

MANAGEMENT STRATEGY

1. Conduct gillnetting surveys every two years to monitor catfish populations and examine growth every four years.

ISSUE 6: Area constituents are interested in TPWD activities and management actions related to Sam Rayburn Reservoir and need to be informed.

MANAGEMENT STRATEGY

1. Continue to publish monthly popular articles on TPWD activities in the Lakecaster, a newsletter distributed to approximately 30 counties in Texas and Louisiana.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual electrofishing and creel surveys to closely monitor the popular largemouth bass fishery (Table 13). Annual creels are also needed to monitor the crappie fishery due to ineffectiveness of trap nets. Gill net surveys will be conducted every two years to adequately monitor catfish populations. Growth of largemouth bass and catfish will be examined every four years.

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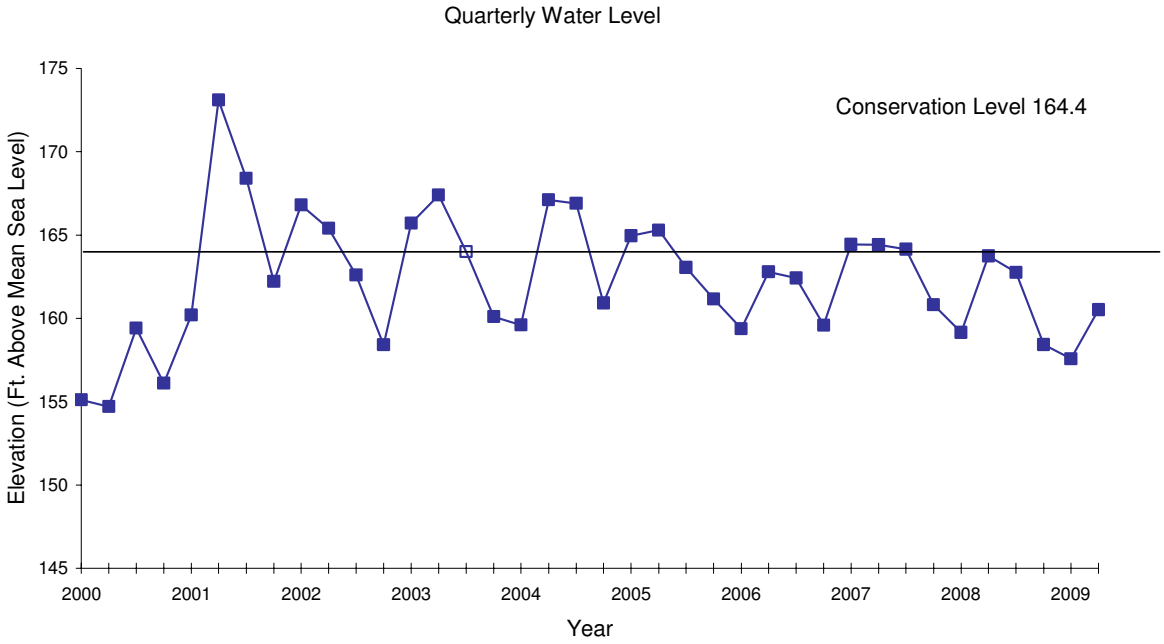


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Sam Rayburn Reservoir, Texas.

Table 1. Characteristics of Sam Rayburn Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	U.S. Army Corps of Engineers
Counties	Jasper, Tyler, Angelina, Nacogdoches, San Augustine, and Sabine
Reservoir type	Mainstream
Shoreline Development Index (SDI)	16.25
Conductivity	120 umhos/cm

Table 2. Harvest regulations for Sam Rayburn Reservoir.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish	25 (in any combination)	12 - No Limit
Catfish, flathead	5	18 - No Limit
Bass, white	25	10 - No Limit
Bass, palmetto	5	18 - No Limit
Bass: largemouth	5[a]	14 - No Limit
Bass: spotted	5[a]	No Limit - No Limit
Crappie: white and black crappie	25 (in any combination)	10 - No Limit

[a]Bag limit for largemouth and spotted bass is 5 in the aggregate.

Table 3. Stocking history of Sam Rayburn 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	1966	105,100	UNK	UNK
	1987	199,870	FGL	2.0
	Total	304,970		
Channel catfish	1966	74,600	AFGL	5.9
	1966	6,100	FGL	2.0
	1973	110,000	AFGL	7.9
	Total	190,700		
Florida largemouth bass	1975	25,000	FRY	1.0
	1976	60,000	FRY	1.0
	1977	60,000	FRY	1.0
	1978	165,000	FGL	2.0
	1978	47,000	FRY	1.0
	1980	361,840	FGL	2.0
	1983	1,200	AFGL	5.0
	1983	37,700	FGL	2.0
	1987	249,660	FRY	1.0
	1990	1,000	AFGL	6.0
	1994	159,360	FGL	1.2
	1994	782,966	FRY	0.7
	1995	232,392	FGL	1.1
	1996	948,017	FGL	1.1
	1996	276,051	FRY	0.9
	1997	317,729	FRY	0.5
	1998	229,200	FGL	1.3
	1999	1,329,160	FGL	1.3
	2000	510,735	FGL	1.4
	2001	500,783	FGL	1.5
	2001	273,407	FRY	0.7
	2002	42	ADL	12.0
	2002	1,066,781	FGL	1.5
	2003	1,033,318	FGL	1.5
	2003	291,008	FRY	0.6
	2004	523,648	FGL	1.6
	2005	1,026,943	FGL	1.5
	2006	499,858	FGL	1.5

Species	Year	Number	Life Stage	Mean TL (in)
Florida largemouth bass (cont'd)	2007	500,033	FGL	1.6
	2008	501,382	FGL	1.6
	Total	12,011,213		
Largemouth bass	1965	364,000	FGL	2.0
	1966	97,000	FGL	2.0
	1988	21	ADL	10.4
	Total	461,021		
Longear sunfish	1965	40,000		2.0
	Total	40,000		
Paddlefish	1990	3,581		7.6
	1991	16,741		7.6
	1992	43,584		8.1
	1995	46,529		3.1
	Total	110,435		
Palmetto bass (striped X white bass hybrid)	1979	571,400	FRY	0.4
	1981	447,528	FRY	0.4
	1982	1,000,000	FRY	0.4
	1985	1,000,000	FRY	0.4
	1987	1,500,000	FRY	0.4
	1988	1,100,000	FRY	0.4
	1989	279,748	FGL	1.5
	1989	1,130,036	FRY	0.4
	1991	1,111,683	FRY	0.4
	1992	1,347,961	FRY	0.4
	1993	1,140,000	FRY	0.4
	1994	1,175,000	FRY	0.4
	1995	943,903	FGL	1.5
	1995	1,469,882	FRY	0.4
	1996	116,000	FGL	1.7
	1997	186,577	FGL	1.3
	1998	406,229	FGL	1.2
	1998	168,428	FRY	0.9
	1999	289,974	FGL	1.2
	2000	290,990	FGL	1.4
	Total	15,675,339		
Redear sunfish	1966	1,400		UNK
	1967	530,000		2.0
	Total	531,400		

Species	Year	Number	Life Stage	Mean TL (in)
ShareLunker largemouth Bass	2008	2,604	FGL	1.5
	Total	2,604		
Striped bass	1976	115,108	UNK	UNK
	1977	843,161	UNK	UNK
	1978	182,800	UNK	UNK
	1979	215,490	UNK	UNK
	1983	1,000,000	UNK	UNK
	Total	2,356,559		
Walleye	1973	426,000	FRY	0.2
	1974	349,400	FRY	0.2
	1975	378,376	FRY	0.2
	1976	220,000	FRY	0.2
	Total	1,373,776		
Warmouth	1965	80,000		2.0
	1966	800		UNK
	Total	80,800		
White crappie	1965	7,000	FGL	2.0
	Total	7,000		

Table 4. Aerial survey of prevalent aquatic vegetation species, Sam Rayburn Reservoir, Texas, September 2004 - 2008. Acreage of each species and percent of total surface area coverage (in parentheses) are presented.

Species	2004	2005	2006	2007	2008
American lotus	1,418 (1)	1,346 (1)	3,573 (3)	2,008 (2)	2,609 (2)
Common salvinia	365 (<1)	trace	680 (1)	299 (<1)	26 (<1)
Giant salvinia					trace
Hydrilla	2,944 (3)	4,876 (4)	9,112 (8)	5,317 (5)	10,185 (9)
Potamogeton spp.	376 (<1)	87 (<1)	89 (<1)	Trace	449 (<1)
Water hyacinth	trace	14 (<1)	132 (<1)	693 (1)	trace

Table 5. Percent directed angler effort by species for Sam Rayburn Reservoir, Texas, 2006 – 2009.

Species	Year		
	2006/2007	2007/2008	2008/2009
Catfishes	7.9	6.8	11.6
Temperate basses	0.3		
Sunfishes	0.2	0.1	0.6
Black basses	70.5	80.2	68.9
Crappies	15.9	11.8	13.7
Anything	5.2	1.2	5.1

Table 6. Total fishing effort (h) for all species and total directed expenditures at Sam Rayburn Reservoir, Texas, 2006- 2009.

Creel Statistic	Year		
	2006/2007	2007/2008	2008/2009
Total fishing effort	731,901	673,289	483,465
Total directed expenditures	$7,334,508	$6,958,608	$5,066,837

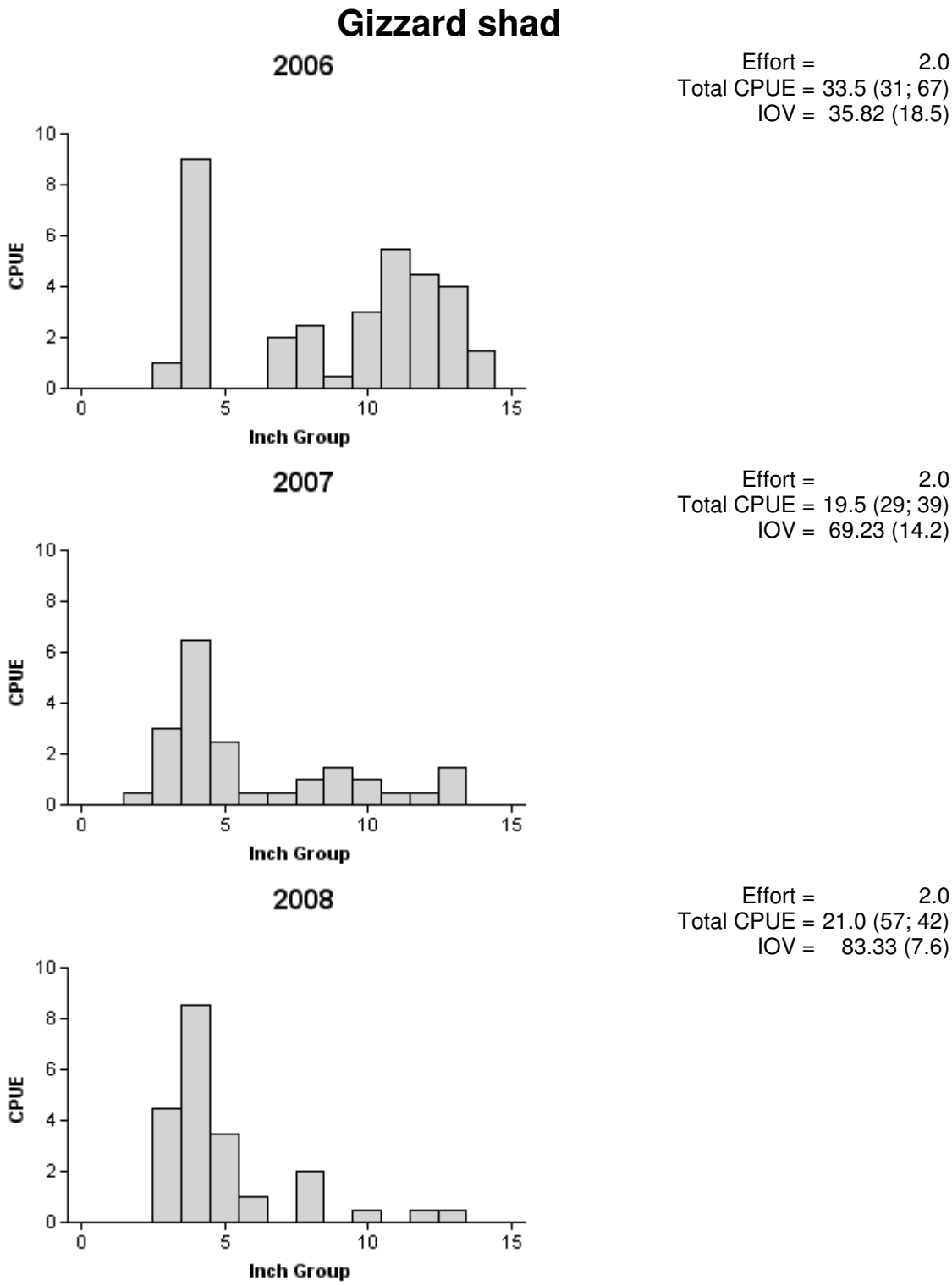


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2006, 2007, and 2008.

Bluegill

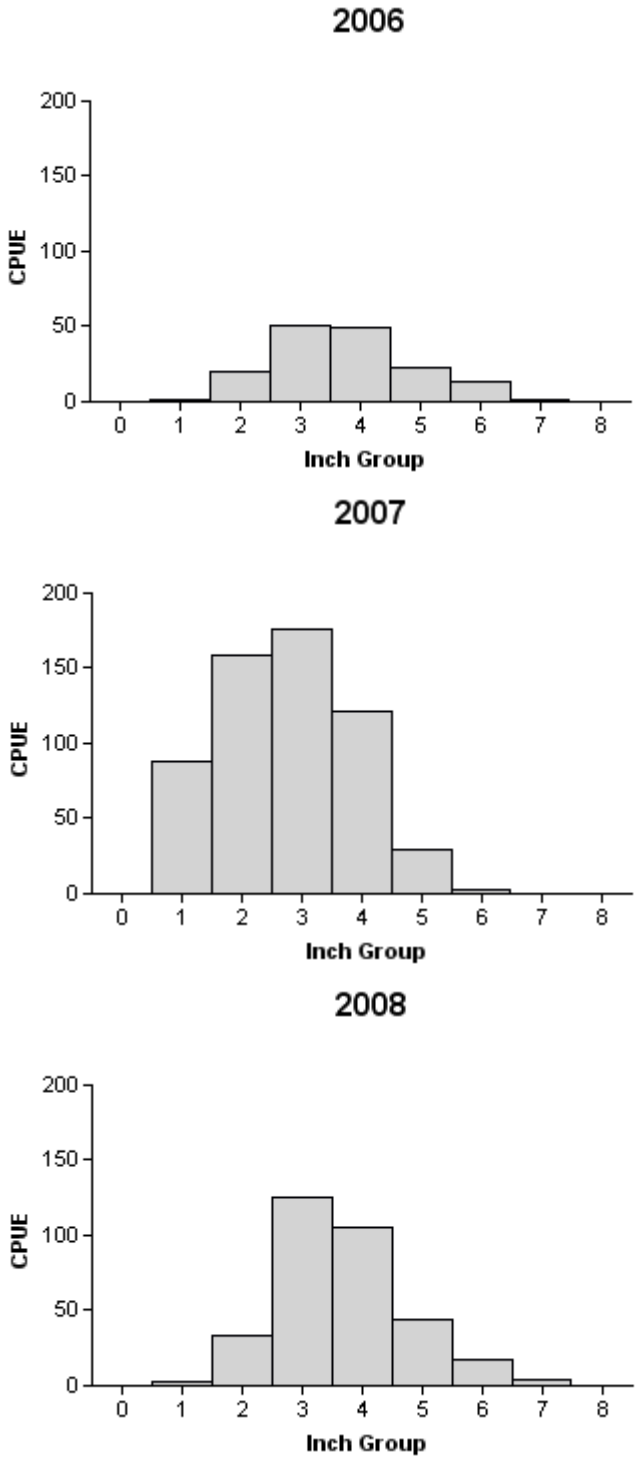


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2006, 2007, and 2008.

Sunfishes

Table 7. Creel survey statistics for sunfishes at Sam Rayburn Reservoir from June 2006 through May 2007, June 2007 through May 2008, and June 2008 through May 2009, where total catch per hour is for anglers targeting sunfishes and total harvest is the estimated number of sunfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2006-2007	2007-2008	2008-2009
Directed effort (h)	1,128.06 (81)	381.02 (119)	2,921.88 (54)
Directed effort/acre	0.01 (81)	<0.01 (119)	0.03 (54)
Total catch per hour	7.75 (83)	15.54 (.)	0.00 (.)
Total harvest	3,292.00 (323)	1,740.08 (345)	1,389.19 (549)
Harvest/acre	0.03 (323)	0.02 (345)	0.01 (549)
Percent legal released	61	72	48

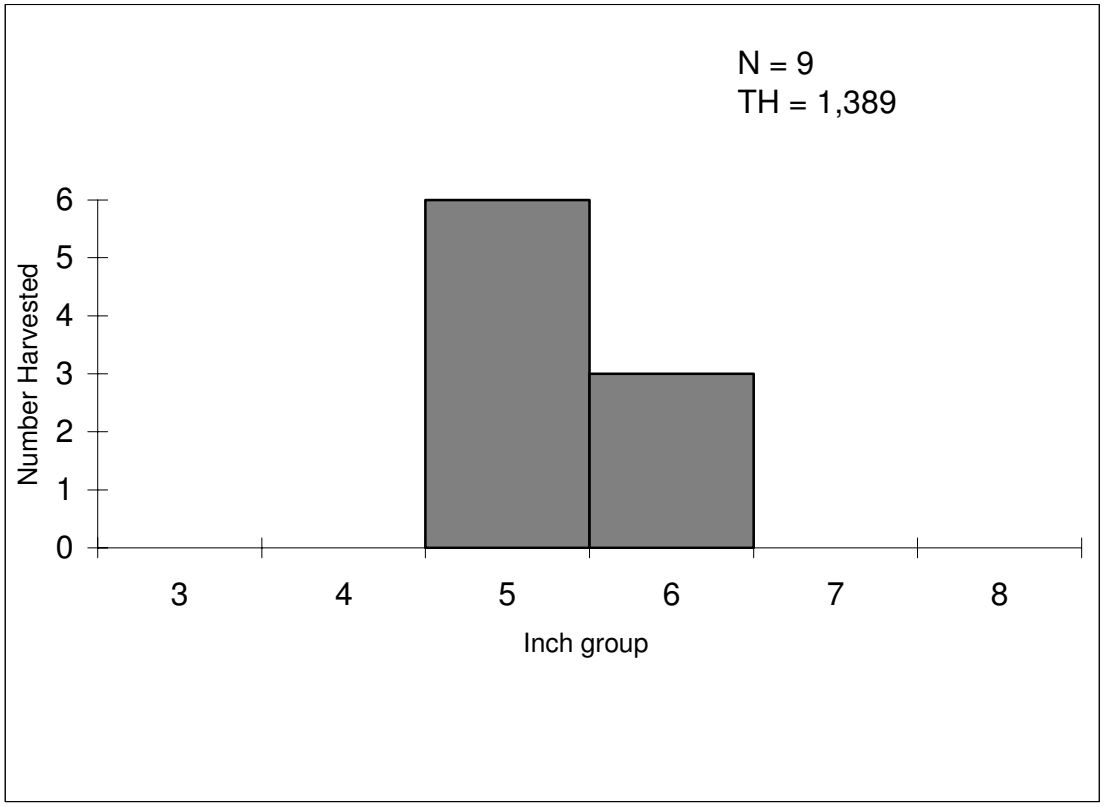


Figure 4. Length frequency of harvested bluegill observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested bluegill observed during creel surveys, and TH is the total estimated harvest for the creel period.

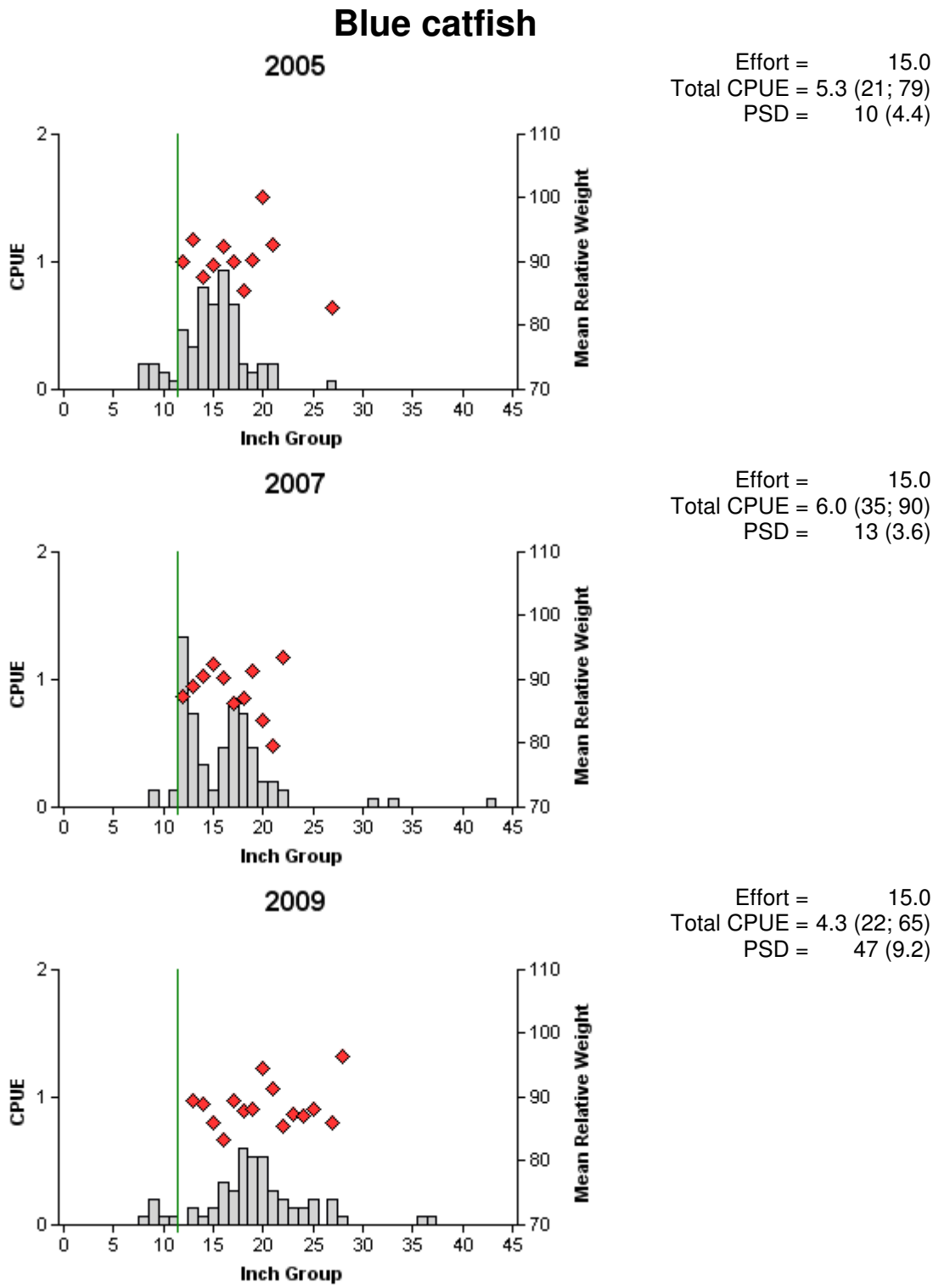


Figure 5. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2005, 2007, and 2009. Vertical lines indicate minimum length limit.

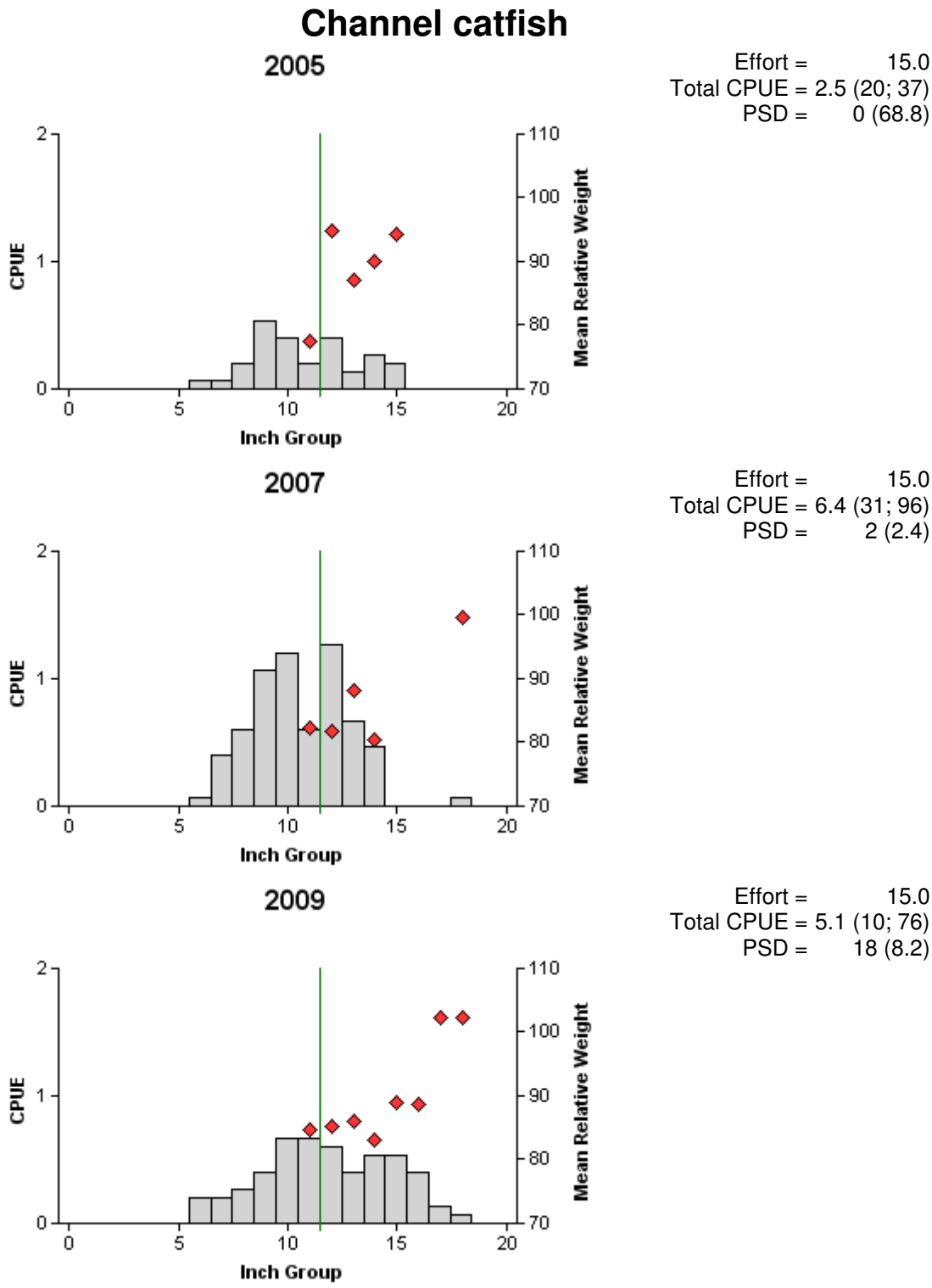


Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2005, 2007, and 2009. Vertical lines indicate minimum length limit.

Catfishes

Table 8. Creel survey statistics for catfishes at Sam Rayburn Reservoir from June 2006 through May 2007, June 2007 through May 2008, and June 2008 through May 2009, where total catch per hour is for anglers targeting catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2006-2007	2007-2008	2008-2009
Directed effort (h)	58,097.36 (16)	45,876.27 (20)	56,072.80 (23)
Directed effort/acre	0.52 (16)	0.40 (20)	0.49 (23)
Total catch per hour	2.58 (26)	2.27 (35)	2.92 (35)
Total harvest	111,931.00 (37)	59,323.39 (19)	112,484.60 (36)
Harvest/acre	1.00 (37)	0.52 (19)	0.98 (36)
Percent legal released	10	1	1

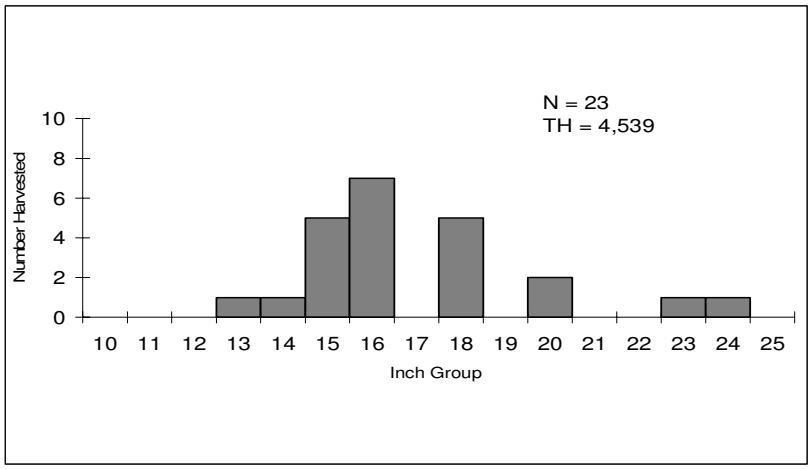


Figure 7. Length frequency of harvested blue catfish observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

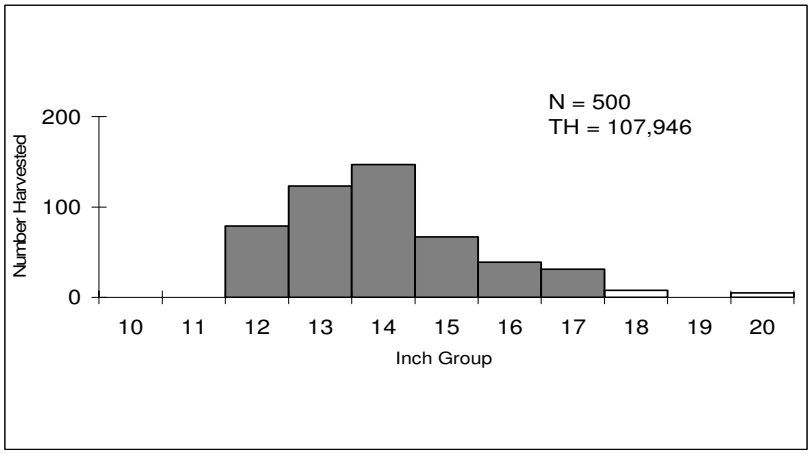


Figure 8. Length frequency of harvested channel catfish observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

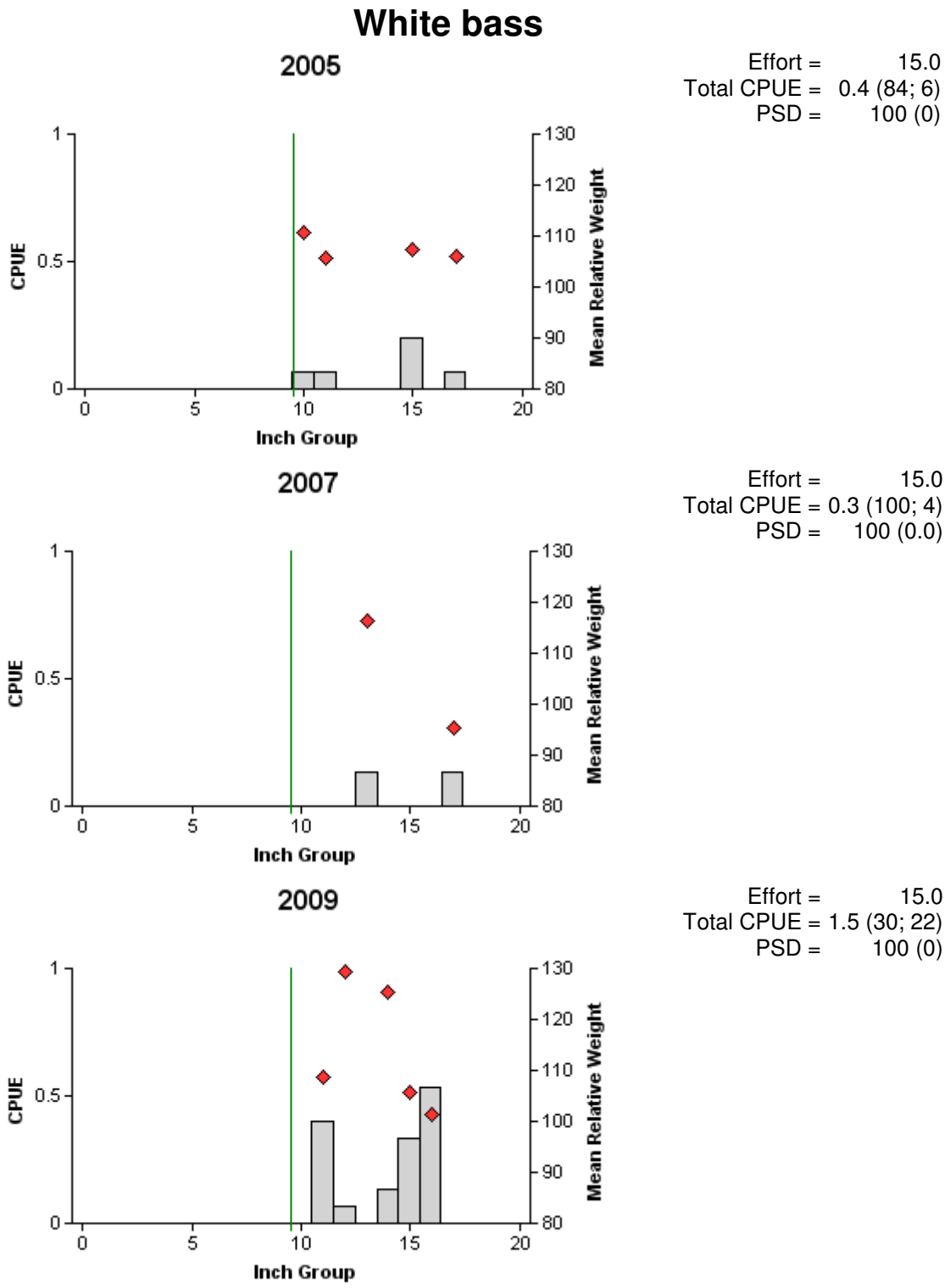


Figure 9. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2005, 2007, and 2009. Vertical lines indicate minimum length limit.

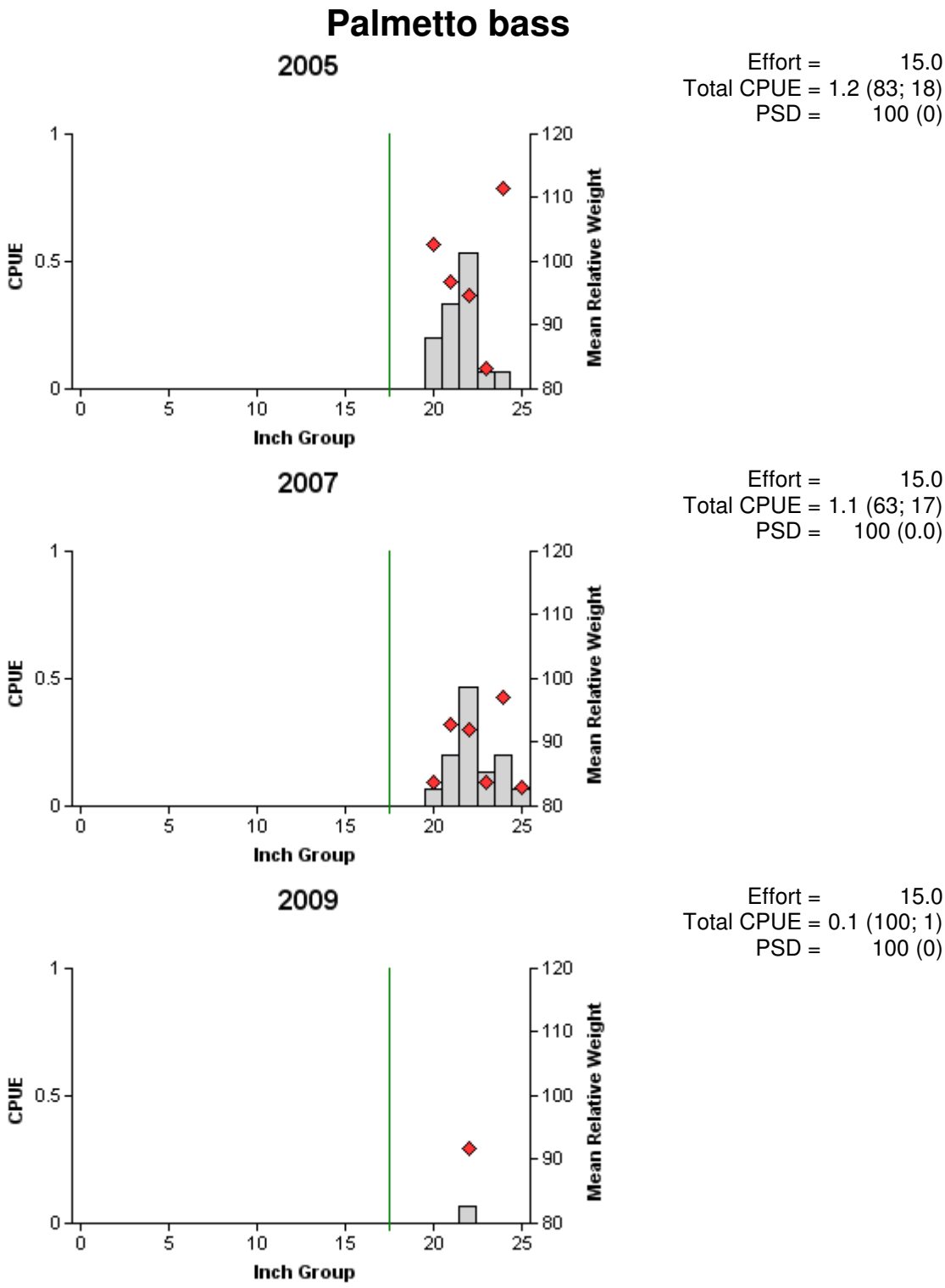


Figure 10. Number of palmetto bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2005, 2007, and 2009. Vertical lines indicate minimum length limit.

Temperate basses

Table 9. Creel survey statistics for temperate basses at Sam Rayburn Reservoir from June 2006 through May 2007, June 2007 through May 2008 and June 2008 through May 2009, where total catch per hour is for anglers targeting temperate basses and total harvest is the estimated number of temperate basses harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2006-2007	2007-2008	2008-2009
Directed effort (h)	2,553.74 (101)		
Directed effort/acre	0.02 (101)		
Total catch per hour	0.00		
Total harvest	734.00 (1,262)	1,168 (794)	1,461 (550)
Harvest/acre	0.01 (1,262)	0.01 (794)	0.01 (550)
Percent legal released	33	64	38

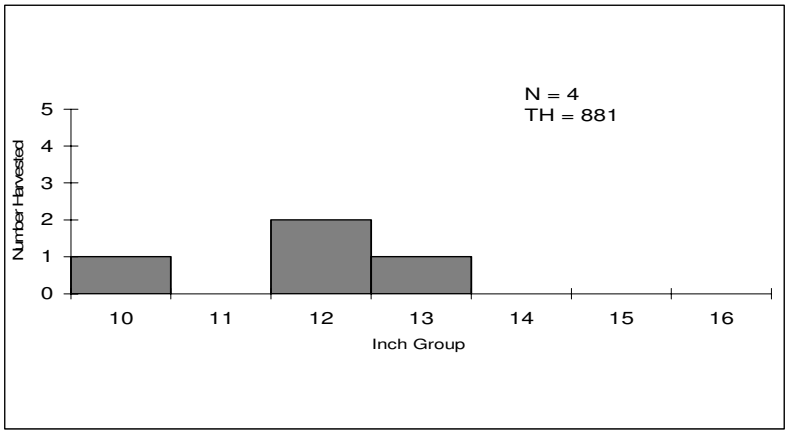


Figure 11. Length frequency of harvested white bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

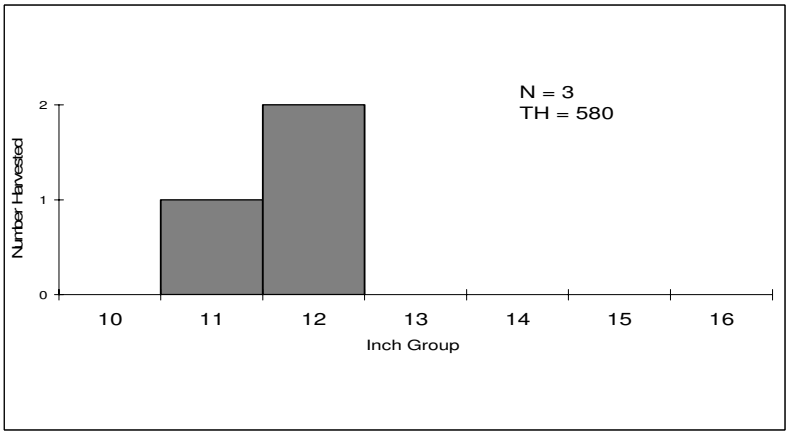


Figure 12. Length frequency of harvested yellow7 bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested palmetto bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

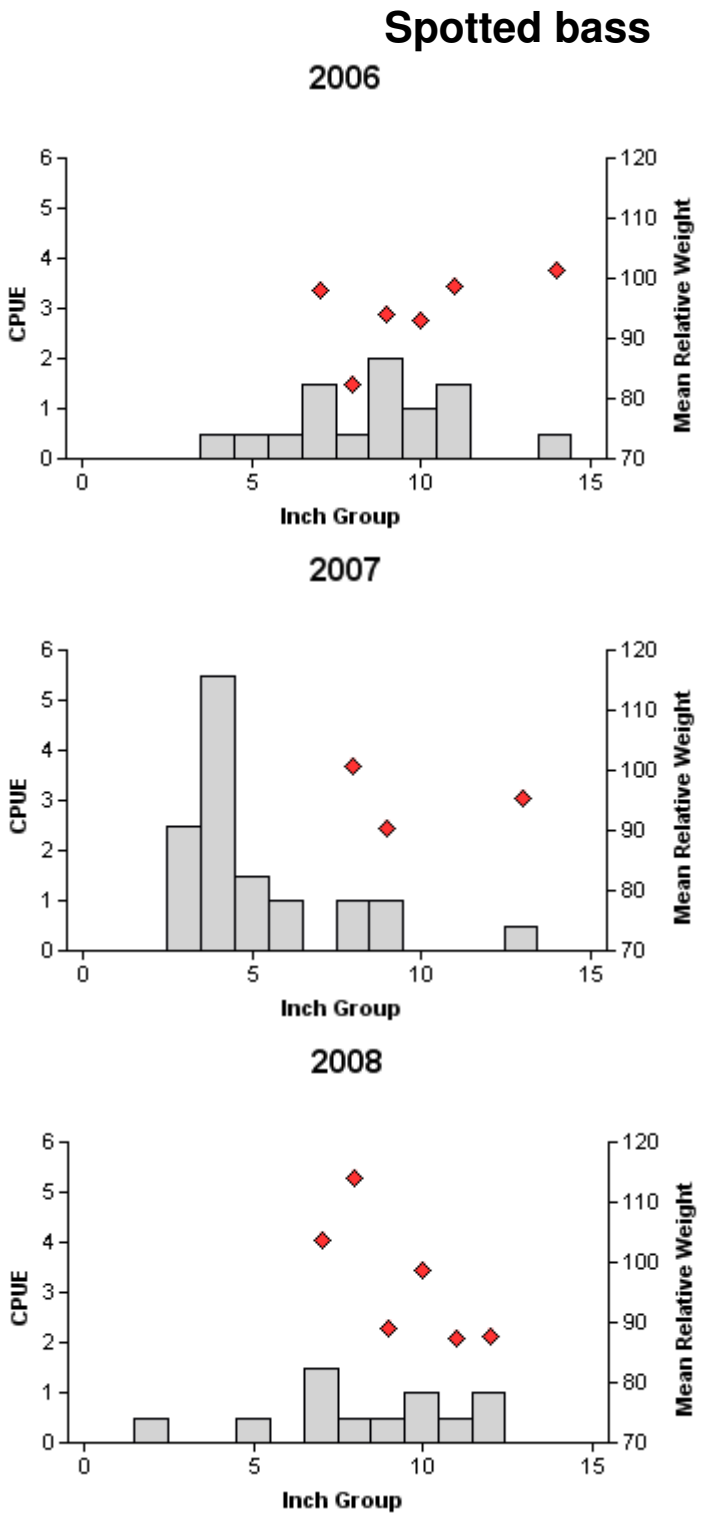


Figure 13. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2006, 2007, and 2008.

Largemouth bass

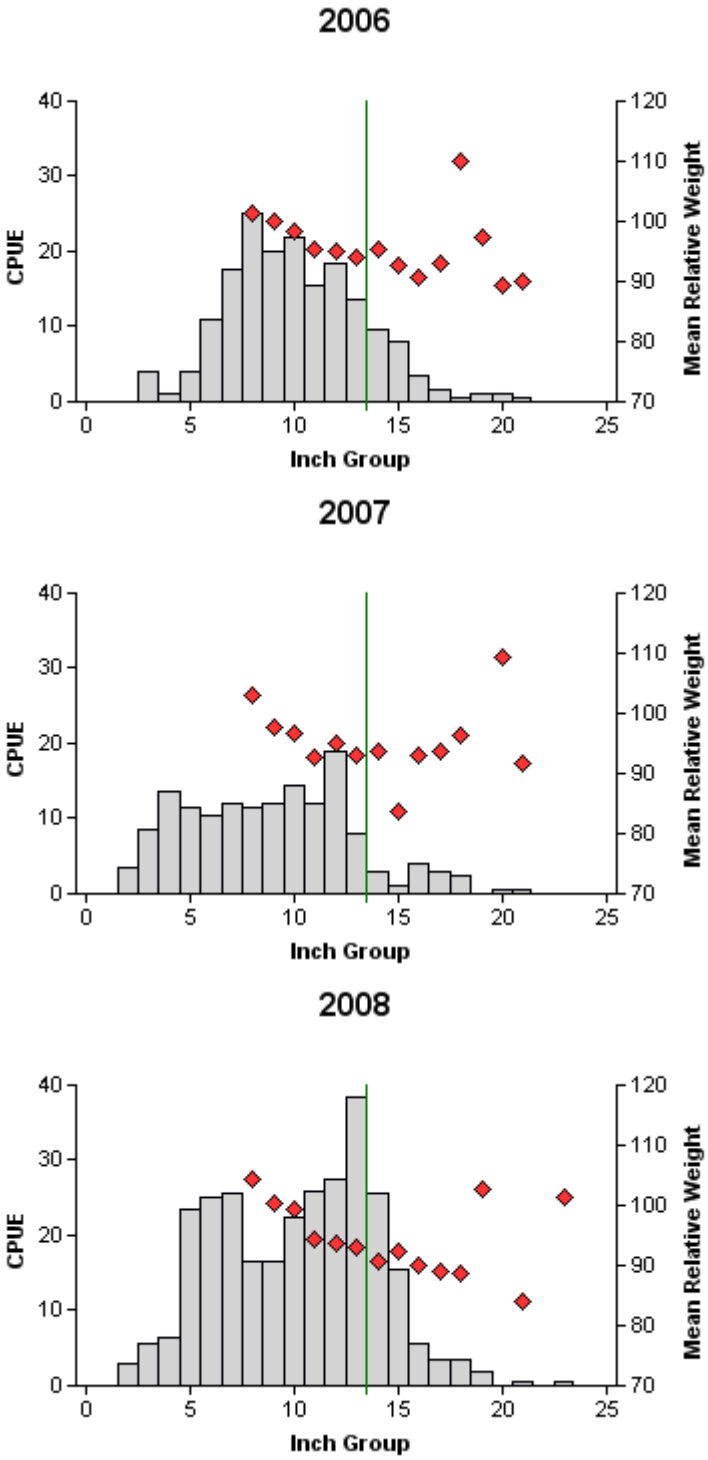


Figure 14. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2006, 2007, and 2008. Vertical lines indicate minimum length limit.

Black basses

Table 10. Creel survey statistics for black basses at Sam Rayburn Reservoir from June 2006 through May 2007, June 2007 through May 2008, and June 2008 through May 2009, where total catch per hour is for anglers targeting black basses and total harvest is the estimated number of black basses harvested by all anglers. Relative standard errors (RSE) are in parentheses. For estimated catch of ≥4, ≥7, and ≥10-pound fish, the percentages of total catch are provided.

Creel Survey Statistic	Year		
	2006-2007	2007-2008	2008-2009
Directed effort (h)	516,136.17 (13)	540,122.73 (14)	333,203.43 (15)
Directed effort/acre	4.60 (13)	4.72 (14)	2.91 (15)
Total catch per hour	0.78 (13)	1.05 (8)	1.10 (11)
Total catch	382,392 (16)	591,243 (15)	455,789 (17)
≥ 4-6.9 pound fish	12,578 – 3.3%	19,459 – 3.3%	13,144 – 2.9%
≥ 7-9.9 pound fish	579 – 0.2%	2,004 – 0.3%	1,200 – 0.3%
≥ 10 pound fish	148 - <0.1%	0	0
Total harvest	113,001.00 (37)	137,411.21 (46)	113,944.8 (33)
Percent harvest tournament-retained	60	65	67
Harvest/acre	1.01 (37)	1.20 (46)	1.00 (33)
Percent legal released	37	43	38

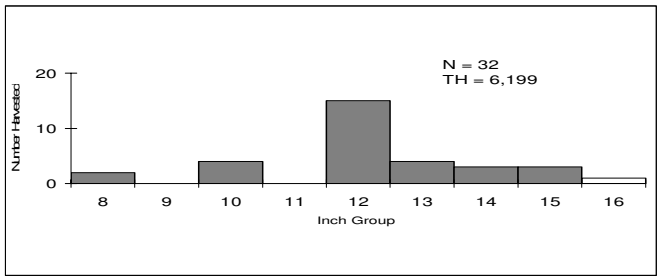


Figure 15. Length frequency of harvested spotted bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

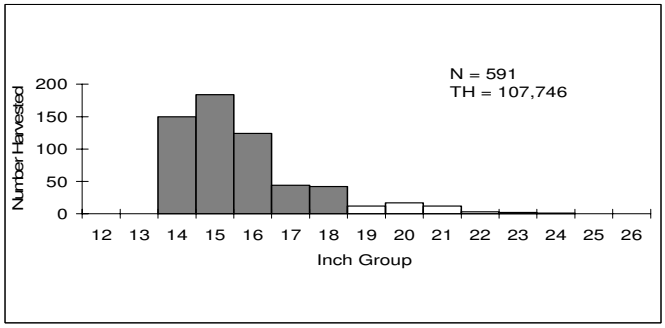


Figure 16. Length frequency of harvested largemouth bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 11. Results of genetic analysis of largemouth bass collected by fall electrofishing, Sam Rayburn Reservoir, Texas, 2005 - 2007. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Fx = first or higher generation hybrid between a FLMB and a NLMB.

		Genotype				
Year	Sample size	FLMB	Fx	NLMB	% FLMB alleles	% pure FLMB
2005	62	3	56	3	47.6	2.0
2006	50	2	48	0	51.0	3.0
2007	30	0	27	3	53.0	0.0

Crappie

Table 12. Creel survey statistics for crappies at Sam Rayburn Reservoir from June 2006 through May 2007, June 2007 through May 2008, and June 2008 through May 2009, where total catch per hour is for anglers targeting crappies and total harvest is the estimated number of crappies harvested by all anglers. Relative standard errors (RSE) are in parentheses

Creel Survey Statistic	Year		
	2006/2007	2007-2008	2008-2009
Directed effort (h)	116,046.07 (14)	79,147.69 (19)	66,380.71 (18)
Directed effort/acre	1.04 (14)	0.69 (19)	0.58 (18)
Total catch per hour	2.37 (17)	1.56 (24)	1.52 (25)
Total harvest	226,160.00 (30)	88,023 (33)	99,086.78 (18)
Harvest/acre	2.02 (30)	0.77 (33)	0.87 (18)
Percent legal released	<1	<1	<1

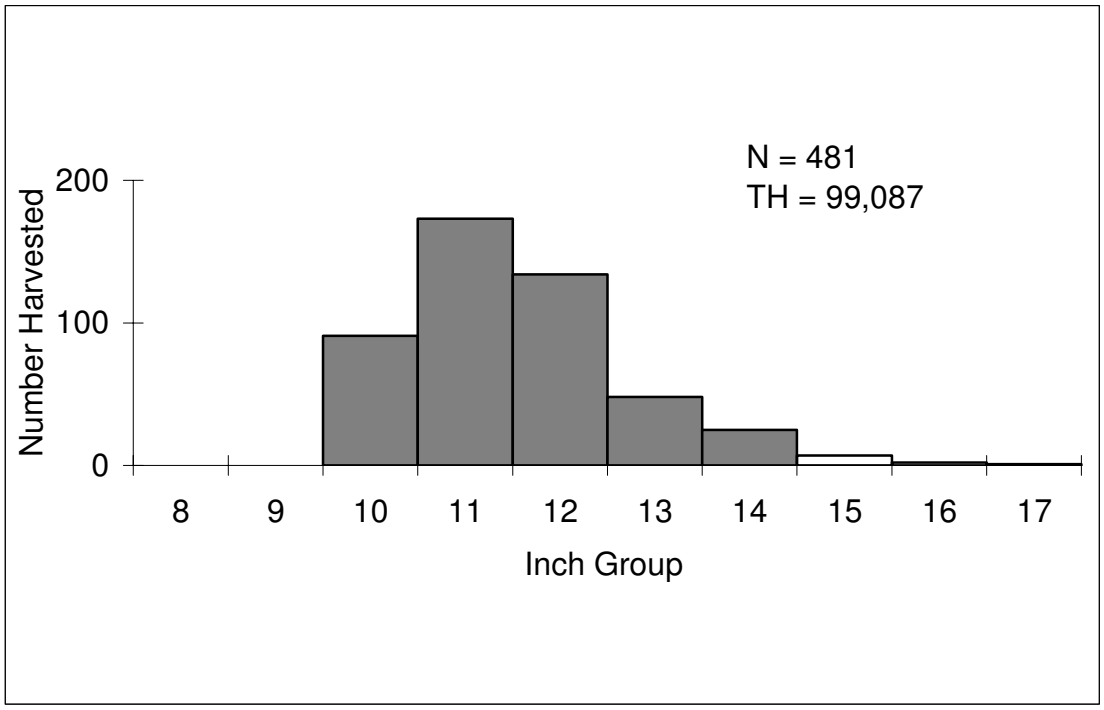


Figure 17. Length frequency of harvested crappie observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2008 through May 2009, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 13. Proposed sampling schedule for Sam Rayburn Reservoir, Texas. Gill netting surveys are conducted in the winter, while electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

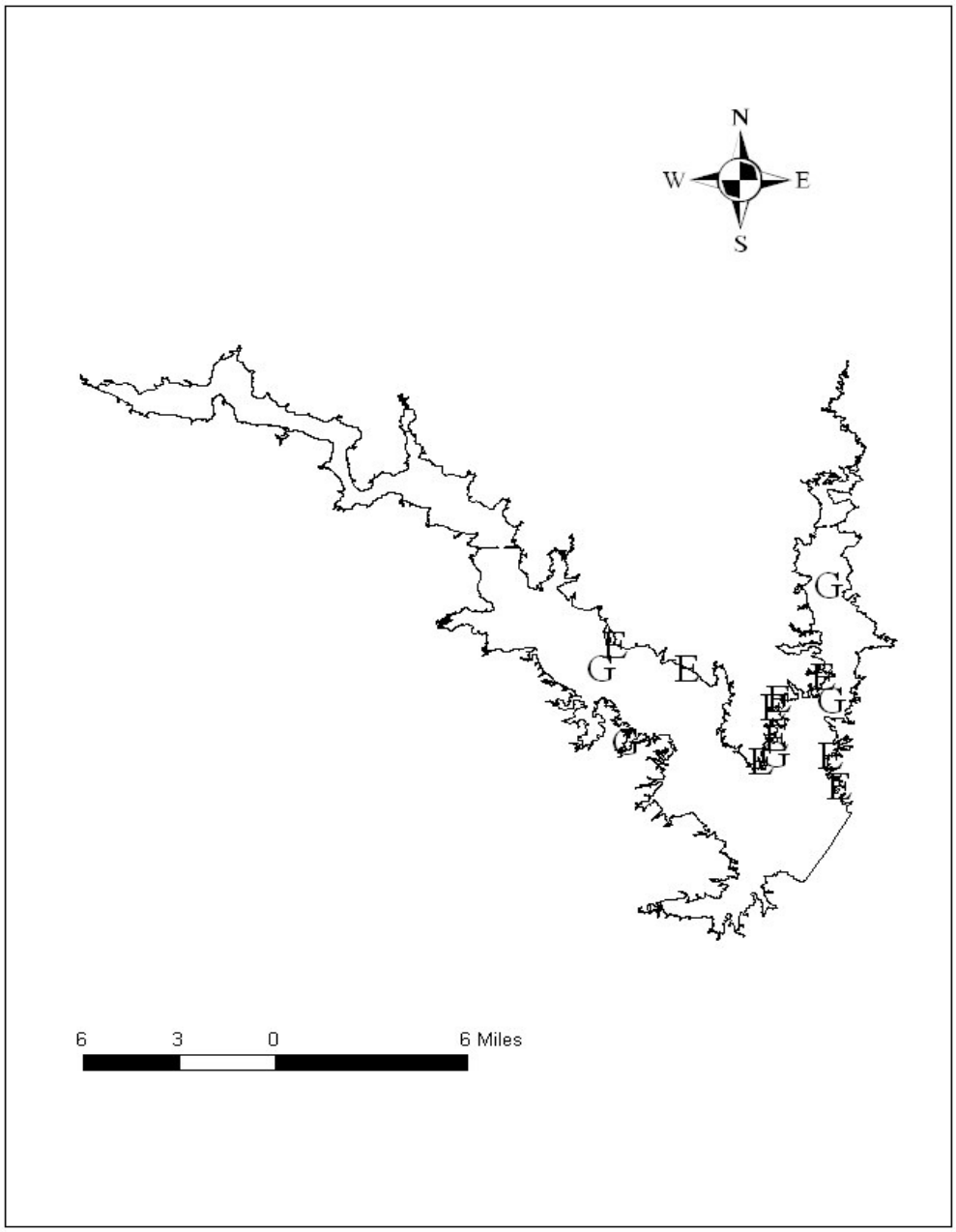
Survey Year	Electrofisher	Gill Net	Creel Survey	Vegetation	Report
2009-2010	A		A	A	
2010-2011	S	S	A	S	S
2011-2012	A		A	A	
2012-2013	A	A	A	A	A

APPENDIX A

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

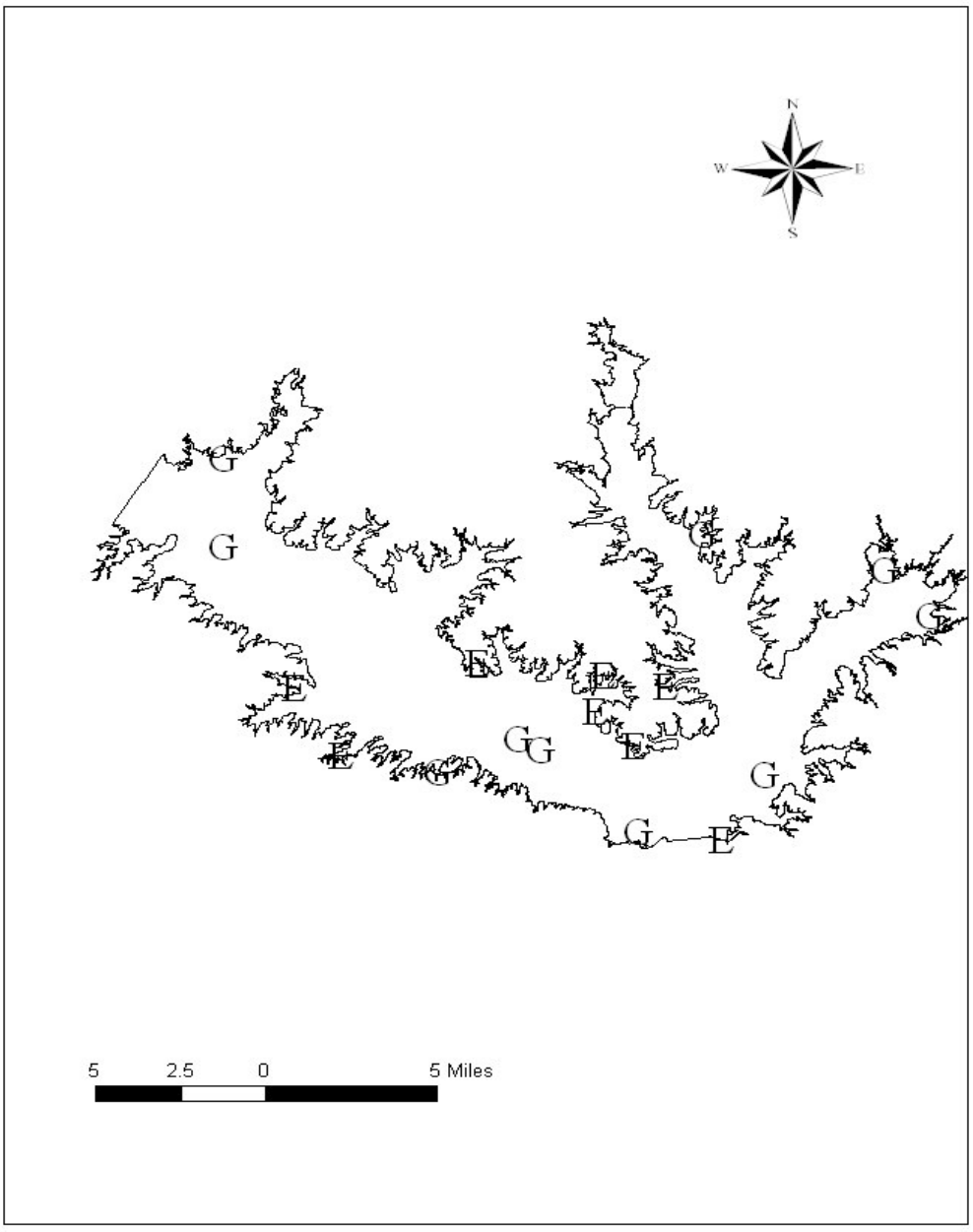
Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Spotted gar	27	1.8		
Longnose gar	5	0.3		
Alligator gar	1	0.1		
Gizzard shad	172	11.5	42	21.0
Threadfin shad			1,296	648.0
Common carp	5	0.3		
Smallmouth buffalo	17	1.1		
Yellow bullhead	1	0.1		
Blue catfish	65	4.3		
Channel catfish	76	5.1		
White bass	22	1.5		
Yellow bass	42	2.8		
Palmetto bass	1	0.1		
Redbreast sunfish			26	13.0
Warmouth			10	5.0
Bluegill			663	331.5
Longear sunfish			17	8.5
Redear sunfish			169	84.5
Spotted sunfish			7	3.5
Spotted bass	10	0.7	12	6.0
Largemouth bass	21	1.4	586	293.0
White crappie	2	0.1		
Black crappie	34	2.3		
Freshwater drum	11	0.7		

APPENDIX B



Location of sampling sites, north Sam Rayburn Reservoir, Texas, 2008-2009. Gill net and electrofishing stations are indicated by G and E, respectively. Water level was near full pool at time of sampling.

APPENDIX B



Location of sampling sites, south Sam Rayburn Reservoir, Texas, 2008-2009. Gill net and electrofishing stations are indicated by G and E, respectively. Water level was near full pool at time of sampling.

APPENDIX C

Results from individual and team format bass tournaments at Sam Rayburn Reservoir, 2004 - 2008. Only tournaments with 5-fish bag limits and > 50 participants or teams were included. Weights are expressed in pounds.

Year	N	1st place weight	2nd place weight	3rd place weight	% total weights > 15 lbs.	% catching limit	Big bass weight
				Individual			
2004	13	21.0	19.2	18.0	7.8	37.7	8.3
2005	14	22.0	20.9	19.5	16.3	57.5	7.7
2006	11	20.2	17.4	16.4	4.2	27.1	8.5
2007	10	23.2	20.0	19.0	11.5	51.2	9.5
2008	7	21.2	19.8	19.1	10.5	53.5	8.1
				Team			
2004	20	22.6	20.6	19.0	10.8	39.0	8.5
2005	17	23.1	20.8	20.1	14.8	51.2	9.1
2006	16	23.4	20.7	19.6	7.7	37.7	8.4
2007	24	24.3	22.3	20.9	14.8	54.4	8.7
2008	24	23.9	21.9	20.7	17.8	57.8	8.9

Results of Sealy Outdoors McDonald's Big Bass Splash tournaments, Sam Rayburn Reservoir, 1997 – 2007. Weights are expressed in pounds.

Year	Average weight of Top 10 fish/hour	Average weight of Top 10 fish/day	Average weight of overall top 10 fish	Weight of overall big fish
1997	6.42 (240)	8.35 (30)	9.07 (10)	10.58
1998	5.99 (239)	9.33 (30)	10.57 (10)	12.10
1999	4.92 (240)	7.21 (30)	8.16 (10)	8.84
2000	5.71 (240)	8.06 (30)	9.08 (10)	10.02
2001	4.80 (240)	6.99 (30)	7.99 (10)	9.64
2002	5.95 (240)	8.21 (30)	9.28 (10)	10.52
2003	6.07 (240)	8.52 (30)	9.32 (10)	10.18
2004	6.80 (240)	8.95 (30)	9.98 (10)	11.83
2005	6.45 (240)	8.81 (30)	9.93 (10)	11.57
2006	5.85 (240)	7.79 (30)	8.91 (10)	9.51
2007	6.32 (240)	8.33 (30)	9.06 (10)	11.08
2008	6.43 (240)	8.51 (30)	9.51 (10)	11.30
2009	6.68 (240)	9.03 (30)	9.97 (10)	10.90

1997 and 1998 were pre-LMBV fish kill

APPENDIX D

Table 11. Results of genetic analysis of largemouth bass collected by fall electrofishing from two 5,000-acre stocking embayments (Caney Creek and Ayish Bayou) and the reservoir, Sam Rayburn Reservoir, Texas, 2002 - 2007.

	Sam Rayburn Reservoir		Caney Creek		Ayish Bayou	
Year	% FLMB alleles	% pure FLMB	% FLMB alleles	% pure FLMB	% FLMB alleles	% pure FLMB
2002	44.5	5.8	57.1	32.5		
2003	44.2	10.1	62.4	25.0		
2004	40.0	9.8	70.5	34.0		
2005	47.6	2.0	63.5	17.0	64.5	9.0
2006	51.0	3.0	69.0	7.0	72.0	7.0
2007	53.0	0.0	75.7	6.7	75.1	23.3