

LEWIS SMITH RESERVOIR MANAGEMENT REPORT

2007

Prepared By

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Introduction

Lewis Smith Reservoir was sampled in 2007 using the guidelines of the Alabama Reservoir Management Program Manual (ADCNR 2001). The purpose of the program is to develop reservoir specific management guidelines designed to improve sportfish population structure and fishing quality. Lewis Smith Reservoir was previously sampled in 2003 (Ekema et al. 2004), 2002 (Greene et al. 2002), 1999 (Greene et al. 1999a), 1998 (Greene et al. 1999b), 1993 (Moss et al. 1994), 1992 (Floyd et al. 1994), 1991 (Moss et al. 1992), and 1990 (Moss and Haffner 1991). The 1993 report (Moss et al. 1994) emphasized the implementation of a 13-16 inch (331-406 mm) protective size range (PSR) for black bass due to decreased growth rates of age -1 largemouth and spotted bass and a continued absence of age -4 and older black bass in the population. The 1998, 1999, 2002, and 2003 reports indicated the PSR should remain in effect since small bass were overabundant and older (larger) fish were becoming more common than in pre-slot years.

In response to tournament angler complaints, Fisheries section personnel re-evaluated the information available and presented several options for the management of black bass to the angling public via a public meeting in 2005. During this meeting, various protective size restrictions were discussed that would be more “friendly” to the average tournament angler. The public was provided self-addressed comment forms and provided a 30 day comment period in which to provide the type of restrictions they would like to see implemented on Smith Reservoir.

At the end of the comment period, Fisheries personnel reviewed all comments from the public and the various length limit models and decided that reducing the PSR from 13”-16” to 13”-15” would still provide protection to the resource while increasing the number of “keeper” size fish to the tournament and recreational angler. The protective size restriction was reduced to

a 13"-15" protective size range in spring of 2005. Angler response to the reduced size range has been positive to date.

Methods

All electrofishing sampling follows that outlined by Ekema et al. (2004). Otoliths were extracted and fish were sexed in the field. Otoliths were aged by district personnel at the District I laboratory. The ADWFF computer program developed by Slipke (2004) was used to assign ages to un-aged fish and summarize length and age specific data. Von Bertalanffy growth curves were fitted to mean length-at-age data and the time to reach various lengths of interest were predicted from respective equations. Simulation modeling was conducted using *Fisheries Analysis Simulation Tools (FAST)* developed by Slipke and Maceina (2001).

Results and Discussion

A total of 137 largemouth bass were collected in the spring of 2007. Of these fish, 105 were stock size or larger with a catch-per-unit-effort (CPE) of 20.6 fish/hour of electrofishing; this is one of the higher CPE's on Smith (Table 2). All RSD categories values fell within or above the lake average values while they were below or within recommended ranges for statewide values. The PSD value was 63, well above the lake mean and also higher than the statewide mean. This value falls within the recommended range of 47-67 suggested by previous Alabama reservoir data. From catch curve regression largemouth bass had an annual mortality rate of 46 % ($r^2 = 0.8977$).

The largemouth bass male:female ratio sampled in the spring was 2.5:1. We probably sampled a higher ratio of males to females this spring due to the drastic weather change that occurred the weekend prior to sampling. A severe cold front passed through North Alabama dropping water temperatures from the low 70's to 60° F. This drastic change in water

temperature would have a tendency to move non-spawning females off-shore. Males that were tending nests and eggs would have remained in shallow water being more vulnerable to electrofishing. Also, the unseasonably high temperatures in late March and early April could have initiated early spawning, again with the larger females moving off shore into deeper water prior to electrofishing.

The spotted bass sample consisted of 138 fish of which only two were females. The unusual weather that occurred prior to and during sampling had a definite effect on the ratio of male:female spotted bass. Regardless of the unusual weather, the RSD values for the different categories were above statewide averages of all RSD categories except Memorable. The CPE values were usually below the statewide means, but were within recommended statewide ranges (Table 4). Relative weight values observed in 2007 were lower than those observed in the past. This was especially evident for the RSD-P and RSD-M categories which usually exhibit higher W_r values on average (Table 4). The PSD value of 50 was slightly below the statewide average but well within the recommended statewide range. The total annual mortality rate for spotted bass ranged from 37 % ($r^2 = 0.6507$) to 48 % ($r^2 = 0.7855$) for un-weighted and weighted catch-curve regression, respectively.

The protective size range (PSR) limit that was implemented in 1995 has positively modified the black bass population size structure in Smith Reservoir. Comparisons of pre-PSR and post-PSR CPE values indicate that catch rates for all size categories of largemouth bass have increased since implementation of the PSR (Table 2). These same comparisons for spotted bass indicate that fish in the stock category have decreased. Relative Stock Density values for spotted bass from the pre-PSR to the post-PSR shows that the population has seen an obvious shift from smaller to larger fish (Table 4).

Growth for largemouth and spotted bass has decreased slightly since the PSR went into effect according to the von Bertalanffy growth equation derived from mean total length-at-age data. It took largemouth bass an average 3.3 years to reach thirteen inches, 3.9 years to reach fifteen inches, and 4.5 years to reach sixteen inches prior to the PSR regulation. After implementation, it took an average of 3.2, 4.2, and 4.8 years respectively, to reach those lengths (Table 6).

Growth rates for spotted bass were similar but slightly slower than that observed for the largemouth bass. It took spotted bass an average of 3.3 years to reach thirteen inches, 4.2 years to reach fifteen, and 4.7 years to reach sixteen inches prior to implementing the PSR and took an average of 3.5, 4.5, and 5.1 years respectively, after the regulation to reach those lengths. The most obvious change in growth for both the largemouth and spotted bass was in the time it took to obtain 20 inches. Both species saw an increase from eight years for largemouth bass and 8.2 years for spotted bass to reach 20 inches prior to the PSR regulation to 9.5 and 9.7 years, respectively after the regulation (Table 6).

Conclusions

Lewis Smith Reservoir's black bass population has experienced positive changes since the PSR went into effect. Largemouth bass electrofishing catch rates have increased for every category and the spotted bass population has shifted from smaller to larger fish. It is recommended that the 13-15 inch Protective Size Range remain intact.

Literature Cited

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APPENDIX A

Tables and Figures

TABLE 1. LEWIS SMITH RESERVOIR MORPHOMETRIC, PHYSICAL AND CHEMICAL CHARACTERISTICS.

Surface area	21,200 surface acres
Drainage area	944 square miles
Full pool elevation	510 feet-msl
Mean annual fluctuation	18 feet
Shoreline distance	500 miles
Shoreline development	24.5 (Welch 1948)
Mean depth	65.5 feet
Maximum depth	264 feet
Outlet depth	210 feet
Thermocline depth	30 feet
Total dissolved solids	22 mg/l
Morphoedaphic index	0.34 TDS/mean depth (Ryder 1965)
Growing season	214 frost free days (Jenkins 1967)
Reservoir age (1961)	42 years

TABLE 2. RELATIVE STOCK DENSITY, CATCH PER EFFORT, RELATIVE WEIGHT, AND PROPORTIONAL STOCK DENSITY OF LARGEMOUTH BASS FROM LEWIS SMITH RESERVOIR, 1990-2007.

Year	Gear	No. of Samples	RSD-S				RSD-Q				RSD-P				RSD-M				TOTAL		
			NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PSD
1990	Electro.	10	16	3.2	40	85	11	2.2	28	86	12	2.4	30	84	1	0.2	3	100	40	8.0	60
1991	Electro.	10	14	2.8	61	78	3	0.6	13	76	6	1.2	26	86	--	--	--	--	23	4.6	39
1992	Electro.	10	28	5.6	43	85	22	4.4	34	84	13	2.6	20	82	2	0.4	3	--	65	13.0	57
1993	Electro.	10	56	11.2	57	82	13	2.5	13	83	20	4.0	20	81	9	1.7	9	84	98	19.6	43
1998	Electro.	10	47	9.4	41	81	40	8.0	35	83	20	4.0	18	89	7	1.4	6	86	114	22.8	59
1999	Electro.	10	41	8.2	55	79	19	3.8	25	78	13	2.6	17	79	2	0.4	3	81	75	15.0	45
2002	Electro.	10	46	9.2	45	80	34	6.8	33	82	20	4.0	20	84	2	0.4	2	91	102	20.4	55
2003	Electro.	10	67	13.4	50	82	40	8.0	30	84	22	4.4	16	81	5	1.0	4	97	134	26.8	50
2007	Electro.	10	39	7.8	37	77	42	8.4	40	76	22	4.4	21	81	2	0.4	2	95	105	20.6	63
	Lake Average		39	7.9	47.7	81.0	25	5.0	27.9	81.3	16	3.3	21.0	83.0	4	0.7	3.9	90.6	84	16.76	52.33
	State Average			20.3	42.8	88.3		15.8	32.9	90.5		9.9	20.4	93.6		1.9	4.0	97.2		47.9	57.2
	75 %tile			25.6	53.2	92.8		20.7	40.2	95.0		13.0	26.1	98.0		2.5	5.2	102.0		61.1	67.2
	25 %tile			10.8	32.8	84.0		8.6	25.9	85.0		4.5	13.2	89.0		0.7	2.0	92.0		29.7	46.8

TABLE 3 . AGE COMPOSITION AND MEAN LENGTH OF LARGEMOUTH BASS FROM LEWIS SMITH RESERVOIR, SPRING 2007.

Age	Year Class	Number	Percent	CPE	Mean TL	SE
1	2006	40	29.2	8.0	177.4	4.5
2	2005	32	23.4	6.4	274.4	6.4
3	2004	35	25.5	7.0	337.3	5.5
4	2003	11	8.0	2.2	381.6	10.1
5	2002	10	7.3	2.0	385.5	12.4
6	2001	7	5.1	1.4	459.6	26.1
7	2000	2	1.5	0.4	437.0	57.0
Total		137	100.0	27.4		

TABLE 4. RELATIVE STOCK DENSITY, CATCH PER EFFORT, RELATIVE WEIGHT, AND PROPORTIONAL STOCK DENSITY OF SPOTTED BASS FROM LEWIS SMITH RESERVOIR, 1990-2007.

Year	Gear	No. of Samples	RSD-S				RSD-Q				RSD-P				RSD-M				RSD-T				TOTAL		PSD
			NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	
1990	Electro.	4	78	42.2	76	98	14	7.6	14	99	9	4.9	9	93	2	1.1	2	96	--	--	--	--	103	20.6	24
1991	Electro.	4	65	33.5	57	95	39	20.1	34	100	9	4.6	8	105	1	0.5	1	100	--	--	--	--	114	22.8	43
1992	Electro.	8	121	32.0	86	94	16	4.2	11	91	3	0.8	2	89	--	--	--	--	--	--	--	--	140	28.0	14
1993	Electro.	10	112	21.5	53	87	89	17.1	42	89	7	1.3	3	95	2	0.4	1	91	--	--	--	--	210	42.0	47
1998	Electro.	10	58	11.6	54	83	26	5.2	24	90	17	3.4	16	91	6	1.2	6	98	--	--	--	--	107	21.4	46
1999	Electro.	10	60	12.0	50	84	48	9.6	40	83	10	2.0	8	89	2	0.4	2	96	1	0.2	1	95	121	24.2	50
2002	Electro.	10	29	5.8	43	86	17	3.4	25	93	18	3.6	26	93	4	0.8	6	92	--	--	--	--	68	13.6	57
2003	Electro.	10	120	24.0	62	89	38	7.6	20	93	28	5.6	14	91	9	1.8	5	93	--	--	--	--	195	39.0	38
2007	Electro.	10	58	11.6	50	84	35	7.0	30	85	21	4.2	18	88	2	0.4	2	62					116	23.2	50
	Lake Average		78	21.58	58.88	88.89	36	9.089	26.64	91.44	14	3.378	11.6	92.67	4	0.8	3.1	91.0	1	0.2	1	95	130.4	26.09	41.0
	Statewide Average			11.9	49.0	94.1		7.7	29.7	98.1		4.4	16.4	99.9		1.2	4.5	104.9					25.3	51.0	
	75 %tile			16.5	64.2	101.0		11.7	37.0	103.0		5.5	22.9	107.0		1.6	6.6	114.5					33.2	64.5	
	25 %tile			6.4	36.3	87.0		3.4	21.0	91.3		1.4	8.1	92.3		0.2	0.9	97.0					1.6	36.4	

TABLE 5 . AGE COMPOSITION AND MEAN LENGTH OF SPOTTED
BASS FROM LEWIS SMITH RESERVOIR, SPRING 2007.

Age	Year Class	Number	Percent	CPE	Mean TL	SE
1	2006	15	10.9	3.0	129.1	6.3
2	2005	59	42.8	11.8	213.0	3.6
3	2004	50	36.2	10.0	319.2	5.6
4	2003	10	7.2	2.0	384.9	8.7
5	2002	2	1.4	0.4	404.5	18.5
6	2001	1	0.7	0.2	392.0	
7	2000	0	0.0	0.0	0.0	
8	1999	0	0.0	0.0	0.0	
9	1998	0	0.0	0.0	0.0	
10	1997	1	0.7	0.2	475.0	
Total		138	100.0	27.6		

TABLE 6. TIME (IN YEARS) TO REACH SPECIFIC LENGTH-OF-INTEREST FOR LARGEMOUTH AND SPOTTED BASS FROM SMITH RESERVOIR.

YEAR	Largemouth Bass					Spotted Bass				
	LENGTHS OF INTEREST					LENGTHS OF INTEREST				
	304	331	381	406	508	304	331	381	406	508
1990	2.7	3.1	4.1	4.6	8.4	2.7	3.1	3.8	4.3	7.5
1991	2.4	3.8	3.7	4.3	8.2	2.5	2.8	3.4	3.8	6.1
1992	2.6	3.0	4.1	4.7	8.5	3.6	4.2	5.5	6.3	11.9
1993	2.6	3.1	4.0	4.4	6.9	3.0	3.3	4.1	4.5	7.3
1999	2.7	3.2	4.2	4.9	11.9	3.3	3.7	4.7	5.3	8.9
2002	2.6	3.1	4.1	4.7	8.4	2.8	3.2	4.1	4.6	10.8
2003	2.7	3.2	4.2	4.8	8.4	3.1	3.5	4.5	5.1	9.4
2007	2.7	3.2	4.3	5.0	9.5	3.2	3.6	4.7	5.4	10.0
No PSR										
1990-93 mean	2.6	3.3	3.9	4.5	8.0	2.9	3.3	4.2	4.7	8.2
PSR in effect										
1999-07 mean	2.7	3.2	4.2	4.8	9.5	3.1	3.5	4.5	5.1	9.7

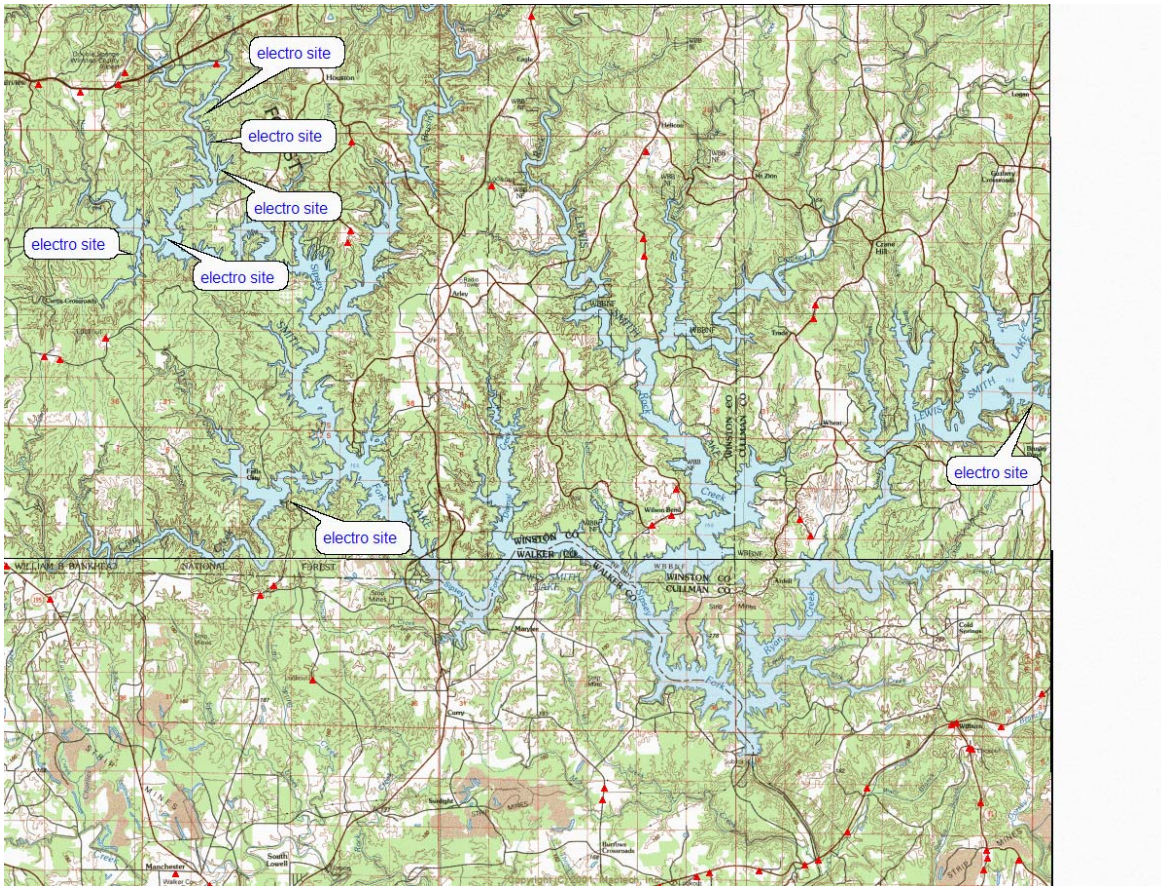


Figure 1. Electrofishing sites, Smith Reservoir, spring 2007.

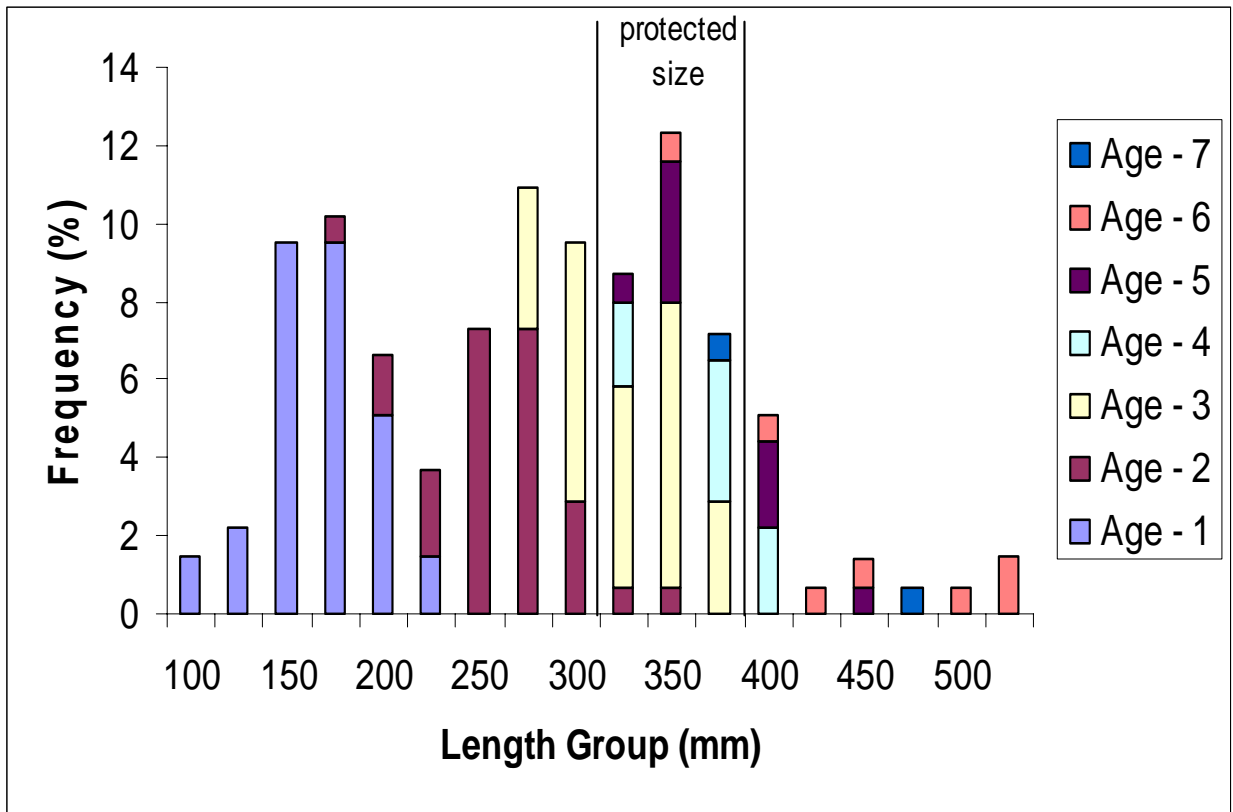


Figure 2. Length-at-age frequency distribution for largemouth bass (n=137) from Smith Reservoir, spring 2007.

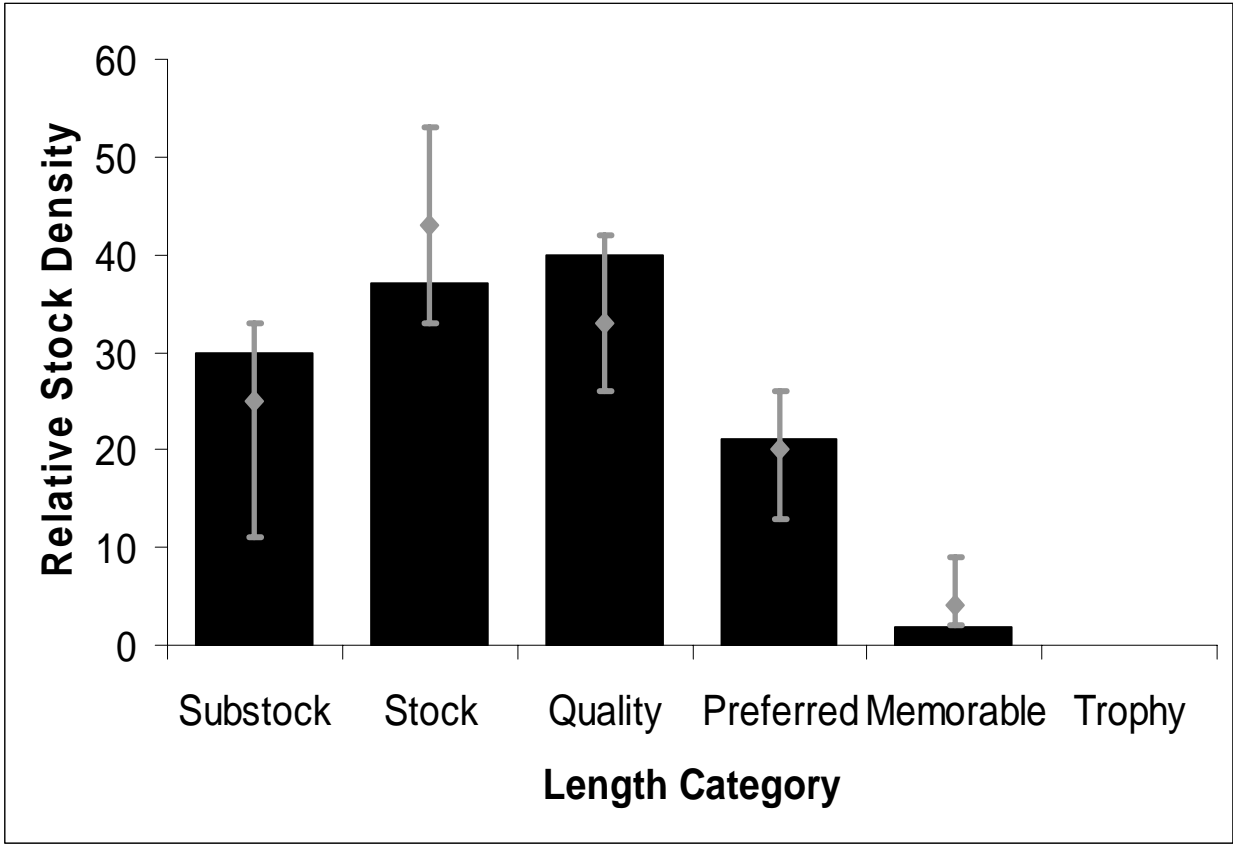


Figure 3. Relative Stock Density for largemouth bass from Smith Reservoir, spring 2007. Vertical bars represent 75th and 25th statewide percentiles, \diamond represents the statewide average.

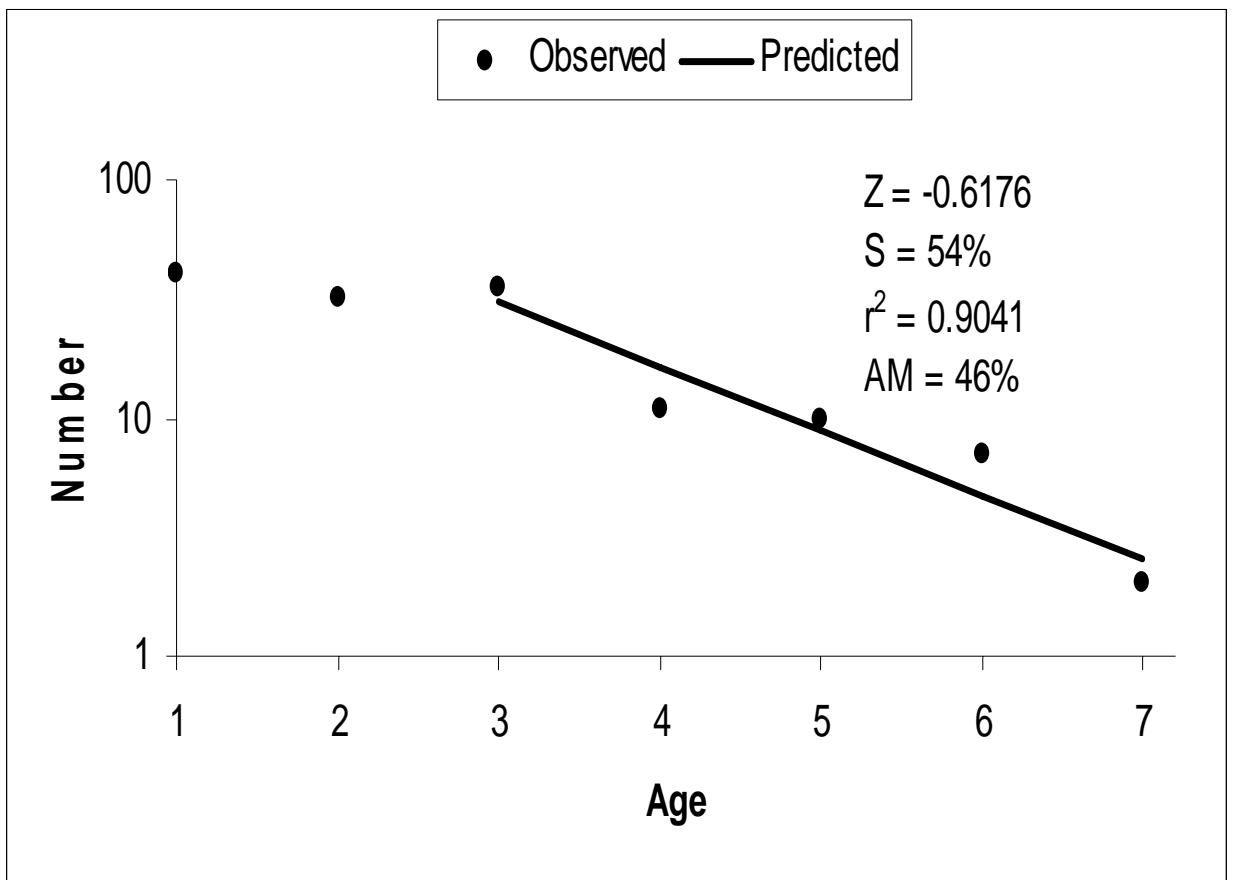


Figure 4. Catch curve regression for largemouth bass age 3-7, collected spring 2007.

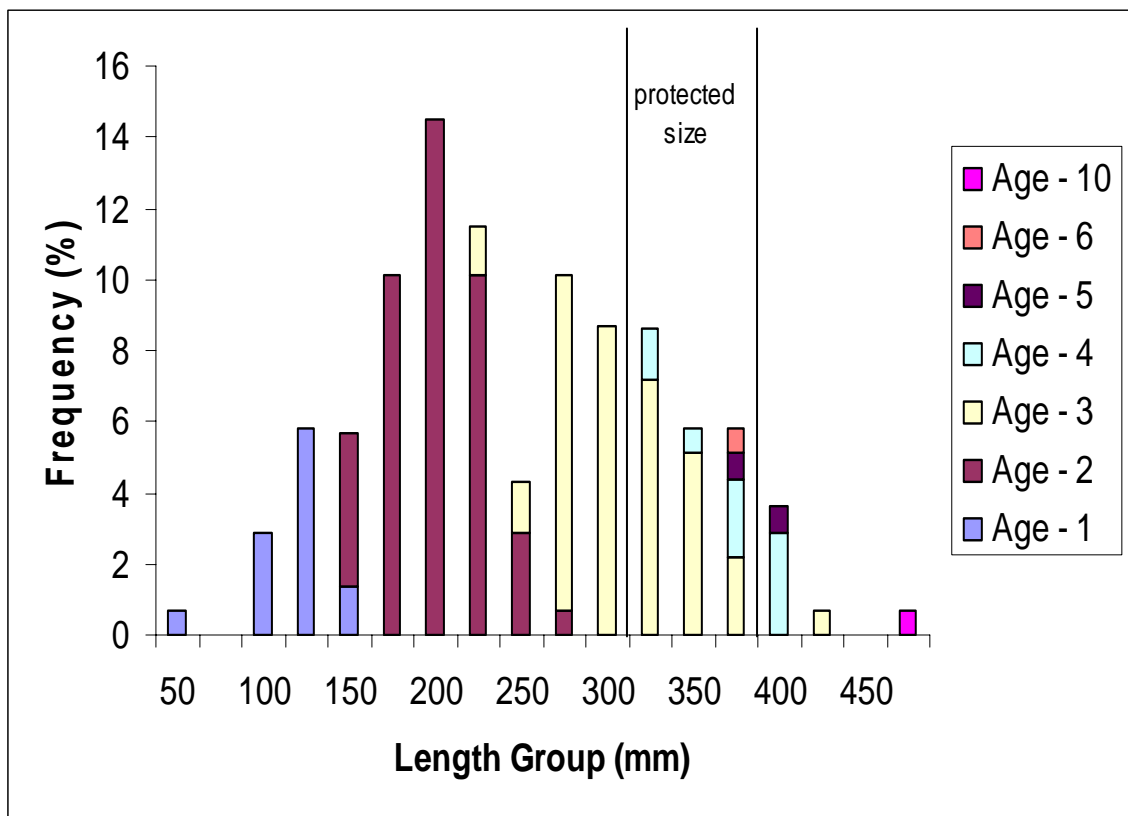


Figure 5. Length-at-age frequency distribution for spotted bass (n=138) from Smith Reservoir, spring 2007.

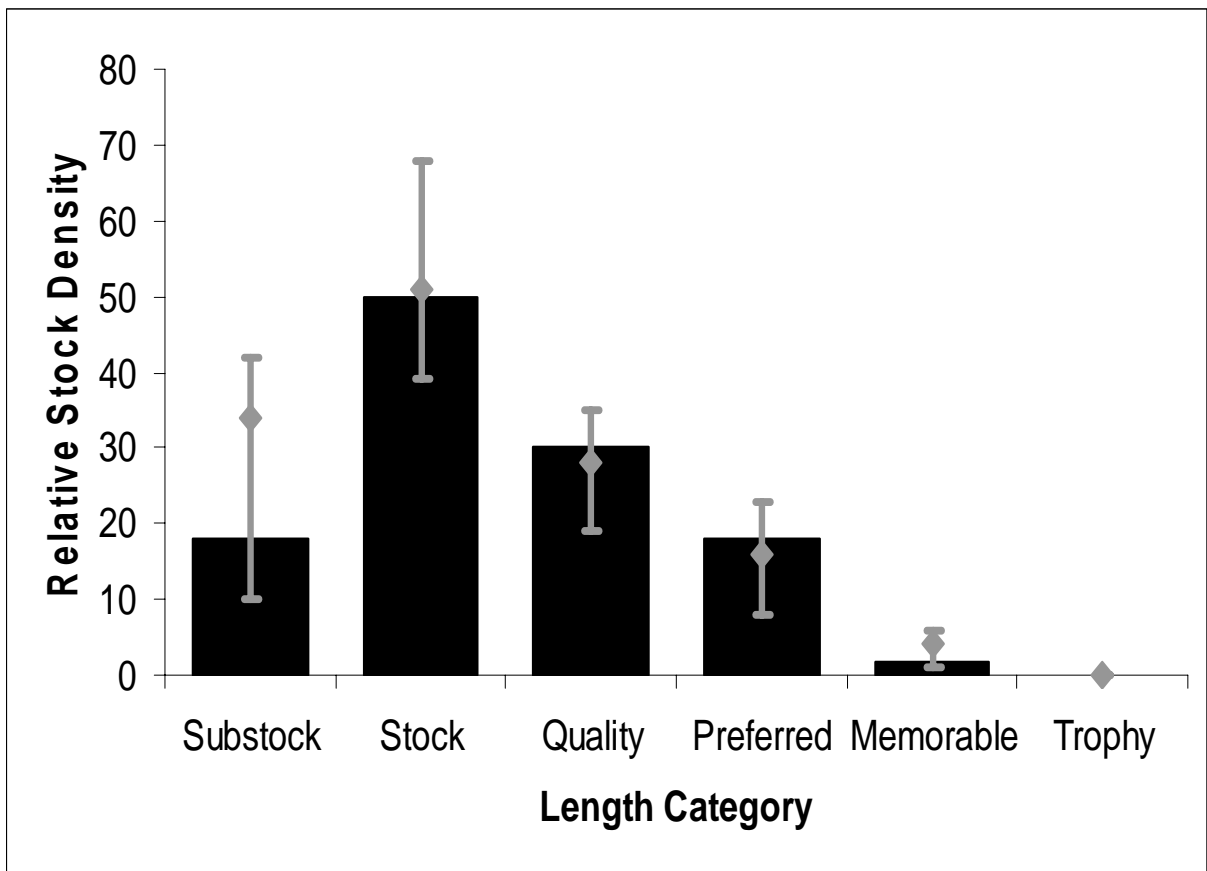


Figure 6. Relative Stock Density for spotted bass from Smith Reservoir, spring 2007. The vertical bars represents the 75th and 25th statewide percentiles. The \diamond represents statewide the mean.

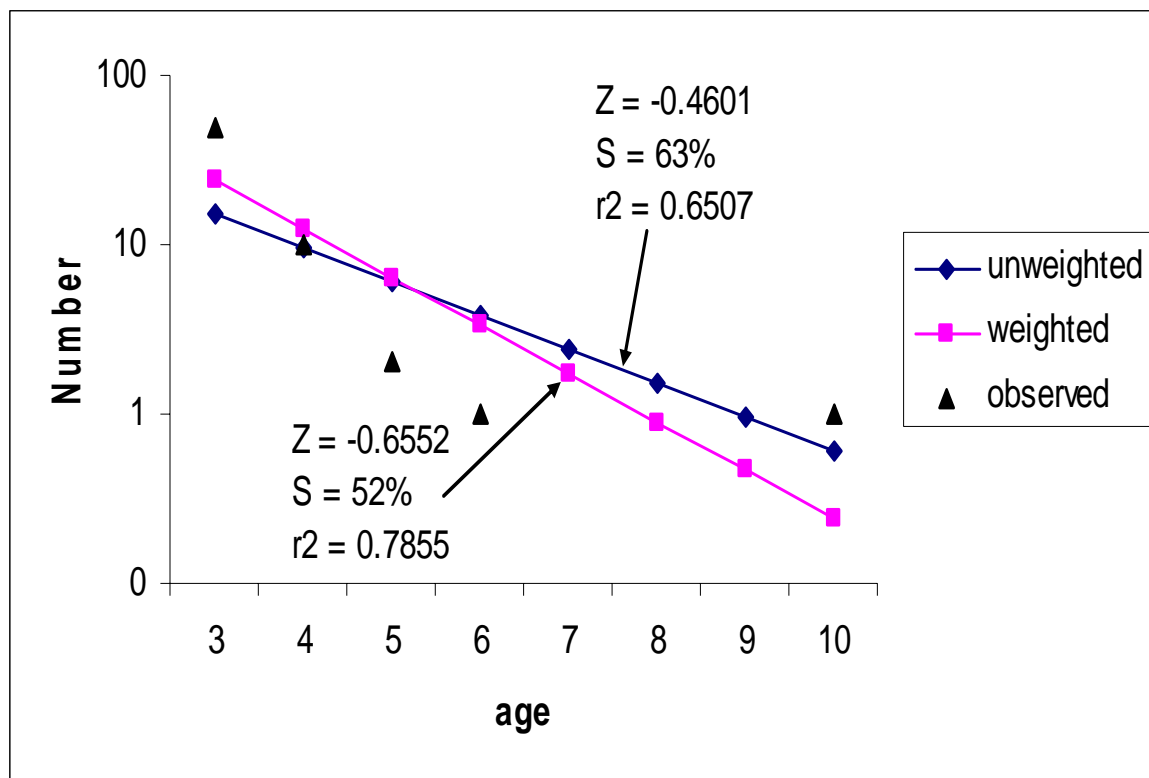


Figure 7. Weighted and un-weighted catch curves for spotted bass age 3-10 from Smith Reservoir, spring 2007.