WILSON RESERVOIR MANAGEMENT REPORT

2009

Prepared By

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Introduction:

The reservoir management objective for Wilson Reservoir is to collect baseline biological data on the important sport fishes. This information will be analyzed and used to formulate management recommendations where needed to correct existing or potential problems concerning the reservoir fishery.

From October 1993 through February 2005 a 381 mm minimum length limit (MLL) was on all black bass. During this time period we observed a decrease in the growth rate of largemouth bass and very few individuals recruiting past 508 mm total length (TL) (Floyd and Ekema 2005). The Bass Anglers Information Team (B.A.I.T.) reports for this time period showed a drastic decrease in tournament angler catch and the number of pounds of bass per angler for Wilson Reservoir (Abernethy, 2009). Also, during this time period we observed a decline in the number of bass in the Memorable -Trophy RSD size category. Based on the low angler catch rates and decline in growth rate we removed the 381 mm MLL in February of 2005.

The sample effort in 2009 is the first opportunity to document changes that may have occurred within the bass population since the MLL was removed.

Methods:

Wilson Reservoir was sampled April 13 – 16, 2009 according to the guidelines of the Reservoir Management Program Manual (1999) with electrofishing gear. Electrofishing consisted of a 30-minute sample at ten randomly selected sites. Electrofishing target species included largemouth bass, smallmouth bass, spotted bass and white and black crappie. Lengths, weights and otoliths were taken from 10 largemouth bass per 25 mm length group greater than 150 mm TL. Lengths and weights were taken from remaining largemouth bass. Lengths, weights and otoliths were taken from all smallmouth, spotted bass and crappie greater than 150 mm TL. All otoliths were read at the District I Fisheries lab. Data analysis was conducted with ADWFF Data Analysis and Report Utilities (Slipke, 2004). Population simulation modeling was conducted using Fishery Analysis and Simulation Tools (Slipke and Maceina, 2006).

Results and Discussion:

Length frequency indices and RSD distribution is indicative of a moderate density bass population (Gablehouse, 1984). Values for the RSD Q-P and RSD P-M categories were well above the statewide averages and lake averages, whereas RSD S-Q values were below state averages and lake averages (Figure 3). Proportional Stock Density value was 76%, above state averages and above the range of 50-70% proposed by Anderson (1976).

Relative Weight (Wr) values have varied over the years. Average Wr's observed in 2009 were at or above lake averages for RSD Q-P and RSD P-M categories and slightly below average for RSD S-Q and RSD M-T (Table 2). These values were above statewide averages for all RSD categories.

The mean-length-at-age has increased from that observed in 2005 and removal of the MLL. Mean TL at age 2 increased from 312 mm to 328 mm TL. Mean TL at age 5 increased from 408 mm in 2005 to 440 mm TL in 2009. All year classes in 2009 exhibited an increase in the mean TL. Although we are seeing an increase in size, mean TL at age values are still below those observed in 1993 (Floyd et al 1994).

Growth for largemouth bass was moderately fast with fish obtaining 304 mm TL by age 2. Mean total lengths exceed statewide means up through age 5. The time in years to reach specific lengths of interest has decreased and is approaching what we observed in 1993 and 1992 (Table 4). The time to reach 510 mm TL is still high and is reflective on the recruitment of larger fish into the system (Figures 6 and 7).

Simulation modeling was conducted using the average estimated conditional natural mortality (cm) of 0.33 (range = 0.24 – 0.40, n = 7). Three minimum length limits were used in the simulations, 300 mm MLL, 380 mm MLL and 400 mm MLL. We can assume that the 300 mm MLL would reflect current conditions since no size limit is in effect and most anglers view 300 mm TL bass as the minimum acceptable for harvest. We predicted that yield would be similar for all three MLL through an exploitation rate of 60% (Figure 5). Floyd and Ekema (2005) estimated a 7% exploitation rate on Wilson Reservoir during spring access creel in 2005. Maciena et al (2003) estimated a maximum exploitation rate of 20% from Wheeler Reservoir by tag returns from anglers. Based on the current exploitation levels observed, a size restriction would not increase yield above the current levels.

We also estimated that the percent of a cohort recruiting to 510 mm TL would be small under all MLL's examined, but would be slightly higher under the larger length limits at the current exploitation and annual survival rates (Figures 6 and 7). Establishing size restrictions have the potential to increase the number of memorable size fish to the population, but the increase would be minimal. Modeling for 1993 and 2009 data shows that six times more bass greater than 510 mm TL were produced in 1993 than 2009 (Figure 8). Annual survival rates in 2009 were 23% lower than observed in 1993. These decreases in survival in association with the decrease in growth rates are major contributors to the decline in numbers of memorable size fish.

Insufficient numbers of other target species were collected for analysis.

Conclusions:

The samples collected in 2009 show improvements in the growth and abundance of the largemouth bass population. Mean total lengths at age and time in years to reach specified lengths have improved and are approaching those observed in the early 1990s. We should begin to see the increase in growth improve the recruitment of bass into the larger size classes.

Literature Cited

Alabama Reservoir Management Manual. 1999. Alabama Department of Conservation and Natural Resources. 77pp.

Abernethy, D. L. 2009. Bass anglers information team 2008 annual report. Alabama Division of Wildlife and Freshwater Fisheries, Montgomery, Alabama.

Anderson, R. O. 1976. Management of small warm water impoundments. Fisheries 1(6):5-7, 26-28.

Floyd, K. B., P. D. Ekema and D. P. Darr. 1994. Wilson reservoir management report 1993. Alabama Game and Fish Division, Montgomery, Alabama.

Floyd K. B. and P. D. Ekema. 2005. Wilson reservoir management report 2005. Alabama Division of Wildlife and Freshwater Fisheries, Montgomery, Alabama.

Gablehouse, D. W. 1984. A length categorization system to assess fish stocks. North American Journal of Fisheries Management. 4:237-285.

Maceina, M. J., J. M. Grizzle, J. W. Slipke and M. P. Holly. 2003. Largemouth bass population and virus assessment on Wheeler Reservoir. Final report submitted to Alabama Division of Wildlife and Freshwater Fisheries, Montgomery, AL

Slipke, J. W. 2004. ADWFF data and report utilities: Version 2.2. Alabama Division of Wildlife and Freshwater Fisheries. Montgomery, Alabama.

Slipke J. W. and M.J. Maceina. 2006. Fishery analyses and simulation tools (FAST): Version 3.0. Auburn University, Alabama.

APPENDIX A

TABLES AND FIGURES

TABLE 1. Wilson Reservoir morphometric, physical and chemical characteristics.

Surface area	15,500	surface acres
Drainage area	30,750	square miles
Full pool elevation	507.5	feet-msl
Mean annual fluxuation	3	feet
Shoreline distance	166	miles
Shoreline development index	10.3	
Mean depth	40.9	feet
Maximum depth	93	feet
Outlet depth	97.5	feet
Total dissolved solids	92	mg/l
Morphoedaphic index	2.2	
Growing season	220	frost free days
Date of Impoundment	1924	

TABLE 2. Relative stock density, catch per unit effort, relative weight and proportional stock density of largemouth bass from Wilson Reservoir, 1992-2009.

		No. of	SUBSTOCK			RSD S-Q				RSD Q-P				RSD P-M				RSD M-T				TOTAL		
Year	Effort	Samples	NO.	CPE	RATIO	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PCT	Wr	NO.	CPE	PSD
1992	5	5	20	9.0	19	29	13.0	28	101	52	23.3	50	101	21	9.4	20	101	1	0.4	1	107	123	55.4	72
1993	4	4	11	7.3	11	20	13.2	20	102	46	30.5	47	105	27	17.9	28	112	5	3	5	112	109	72.2	80
1995	10	10	5	1.0	3	60	12.0	35	80	46	9.2	27	86	52	10.4	31	93	12	2.4	7	103	175	35.0	65
1996	10	10	38	10.8	14	87	24.7	32	93	111	31.6	41	103	68	19.3	25	105	8	2.2	3	105	312	88.8	68
1998	10	10	93	18.6	34	85	17.0	31	95	135	27.0	49	100	50	10.0	18	100	3	0.6	1	90	366	73.2	69
2000	10	10	19	3.8	5	99	19.8	28	88	183	36.6	52	93	72	14.4	20	92	1	0.2	0	85	374	74.8	72
2002	10	10	75	15.0	34	72	14.4	33	94	98	19.6	45	95	49	9.8	22	94	1	0.2	0	120	295	59.0	67
2003	10	10	87	17.4	28	129	25.8	41	93	117	23.4	37	102	66	13.2	21	105	2	0.4	1	103	401	80.2	59
2005	10	10	54	10.8	15	116	23.2	32	87	144	28.8	40	94	98	19.6	27	97	0	0.0	0		412	82.4	68
2009	10	10	21	4.2	5	104	20.8	24	92	212	42.4	49	100	116	23.2	27	101	3	0.6	1	101	456	91.2	76
Lake Average				9.8	17		18.4	30	93		27.2	44	98		14.7	24	100		1.0	2	103		71.2	70

Table 3 . Age composition and mean length of largemouth bass from Wilson Reservoir, spring 2009.

Age	Year Class	Number	Percent	CPE	Mean TL	SE
1	2008	98	21.5	19.6	217.3	2.4
2	2007	177	38.8	35.4	328.0	2.0
3	2006	120	26.3	24.0	378.2	2.6
4	2005	11	2.4	2.2	398.4	15.1
5	2004	30	6.6	6.0	440.0	4.3
6	2003	6	1.3	1.2	482.8	11.1
7	2002	11	2.4	2.2	483.1	8.6
8	2001	2	0.4	0.4	487.5	12.5
9	2000	1	0.2	0.2	492.0	
Total		456	100.0	91.2		

TABLE 4. Survival and growth rates of largemouth bass from Wilson Reservoir, spring 1992-2009. Annual survival (%) was estimated for age-3 and older fish using weighted and unweighted catch curve regressions. The time to reach 304, 381, 406, and 510 mm TL was estimated with von Bertalanffy equations using mean length at age data. NC= not computed.

	Survival			Growth Time in years to reach TL(mm)			
Year	Age Range	Weighted	Unweighted	304	381	406	510
1992	2-6	NC	62	1.87	3.00	3.60	NC
1993	3-8	72	73	2.01	3.02	3.44	6.40
1995	3-9	60	61	2.48	3.30	3.66	7.04
1996	3-12	52	61	2.11	3.45	4.01	7.76
1998	3-10	62	62	2.60	4.12	4.76	9.46
2000	3-9	70	68	2.05	3.43	4.04	10.72
2002	3-9	47	48	2.45	3.81	4.43	12.50
2003	3-11	51	57	2.27	3.87	4.53	8.75
2005	3-7	43	41	2.04	3.54	4.35	NC
2009	3-9	51	51	1.90	3.20	3.80	9.70

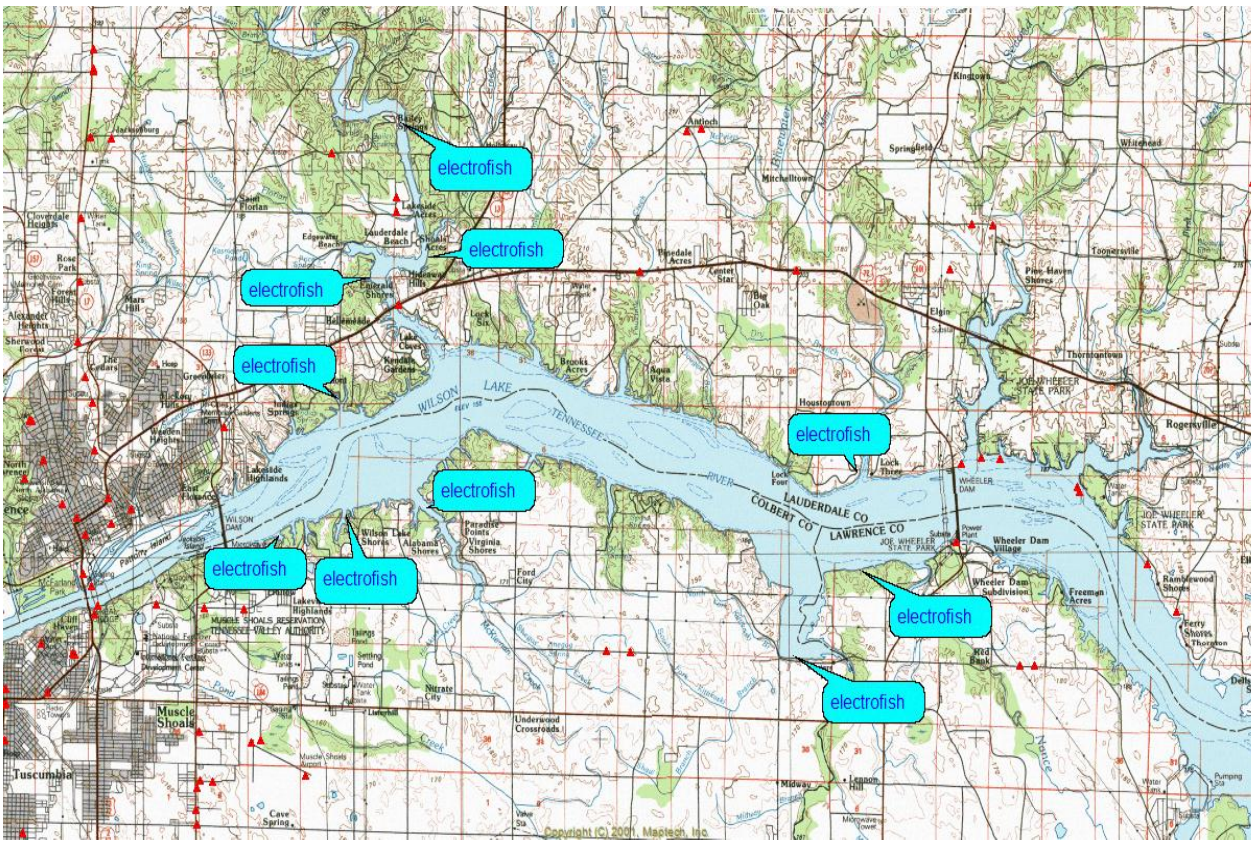

FIGURE 1. Electrofishing sites for Wilson Reservoir, spring 2009.

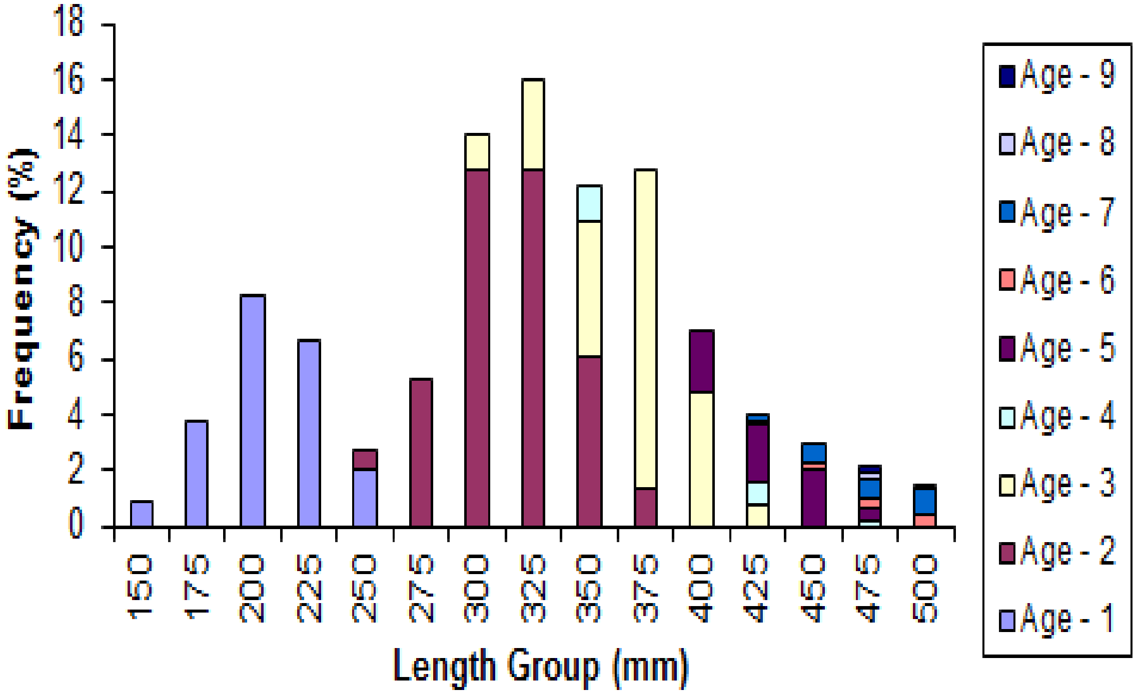

FIGURE 2. Length-at-age frequency distribution for largemouth bass (N=456) from Wilson Reservoir, spring 2009.

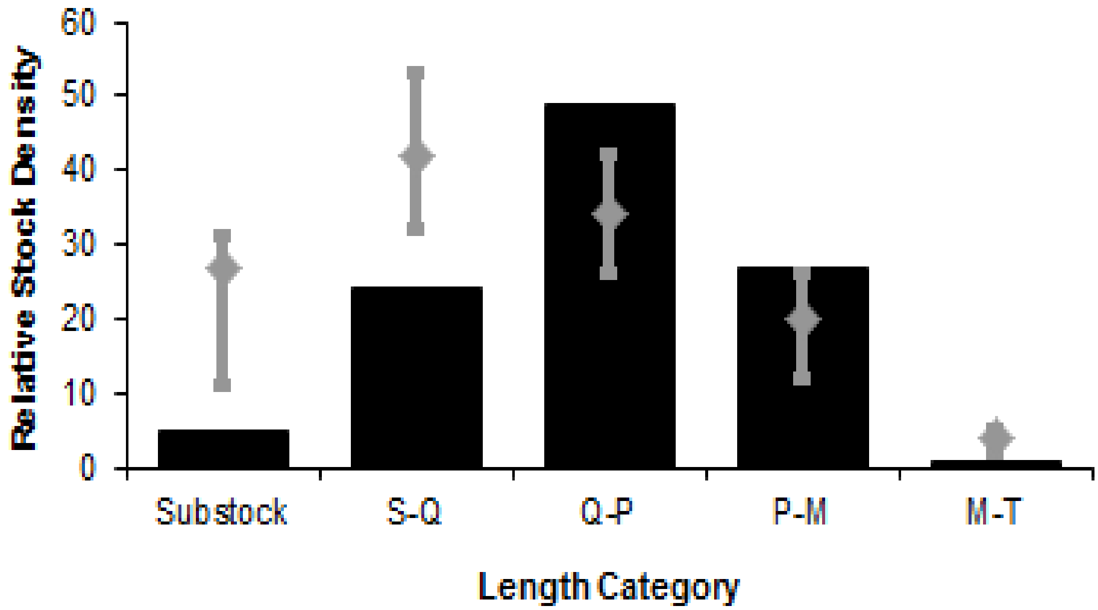

FIGURE 3. Relative Stock Density (RSD) of largemouth bass (N=456) from Wilson Reservoir, spring 2009. The I-bars represent the statewide 75th and 25th percentile where as the ◊ represents the statewide mean.

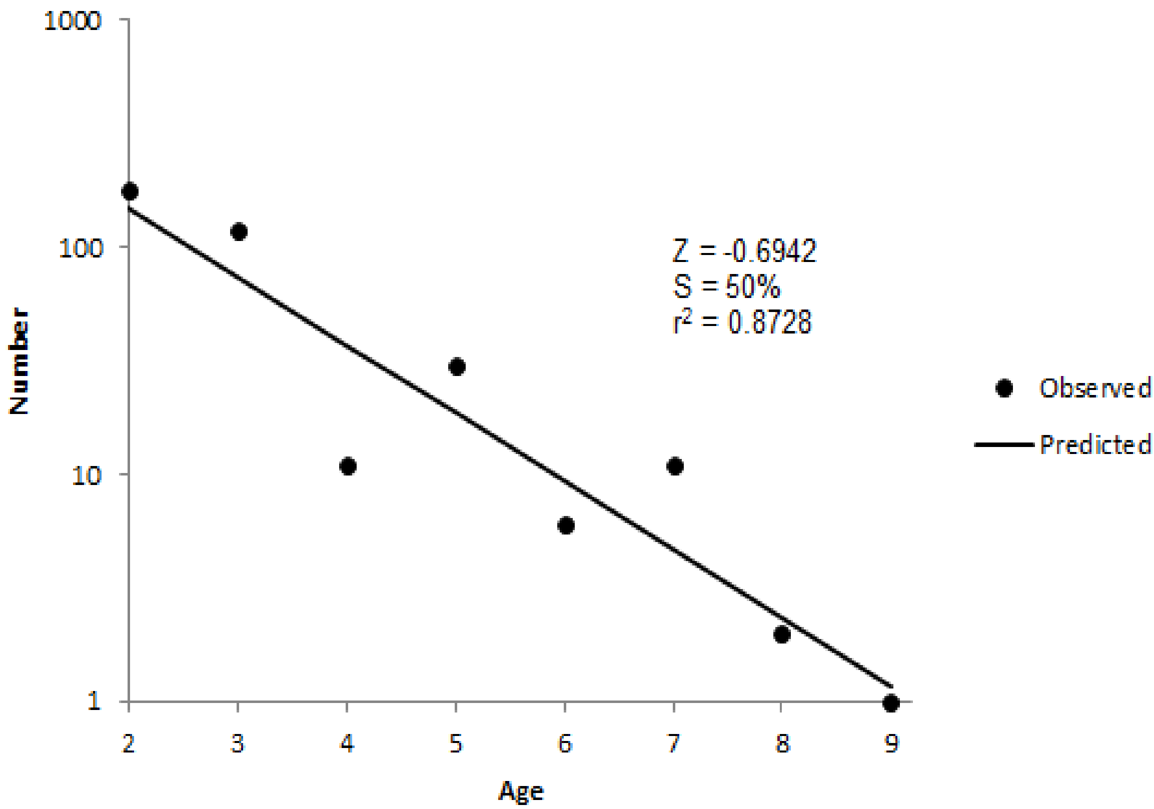

FIGURE 4. Catch-curve regression for largemouth bass age 3-9 from Wilson Reservoir, spring 2009.

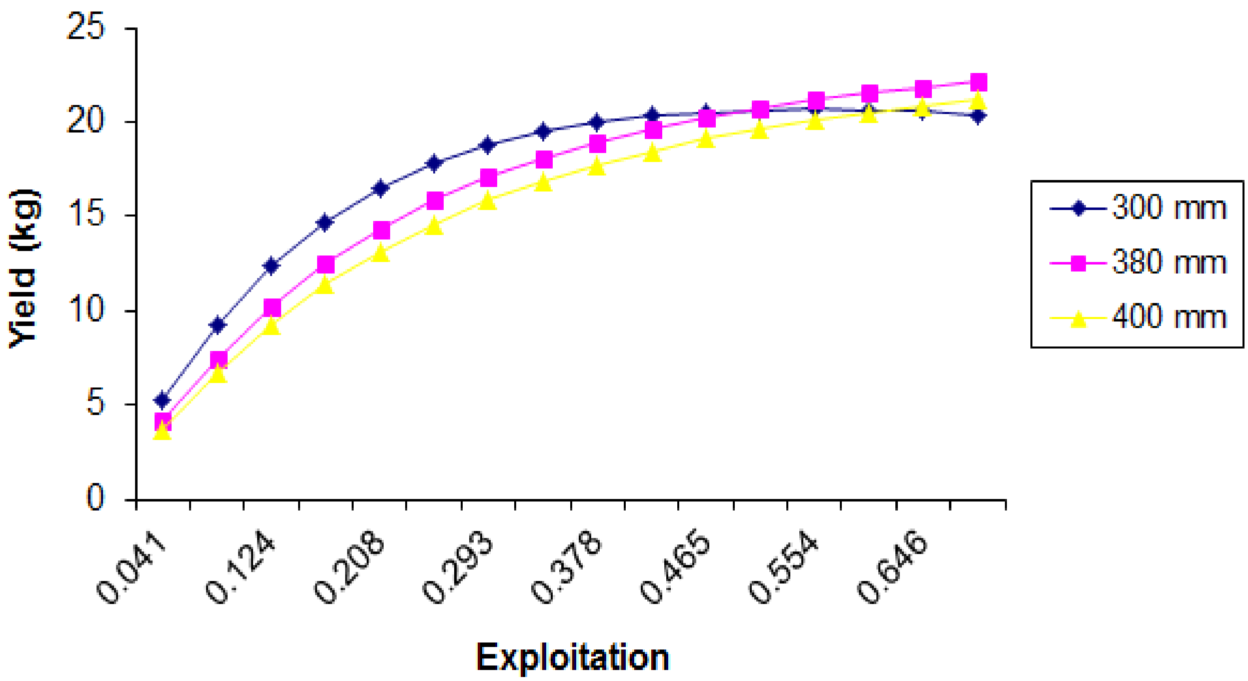

FIGURE 5. Total yield of largemouth bass modeled under minimum length limits of 300 mm TL, 380 mm TL and 400 mm TL. Conditional natural mortality = 33%

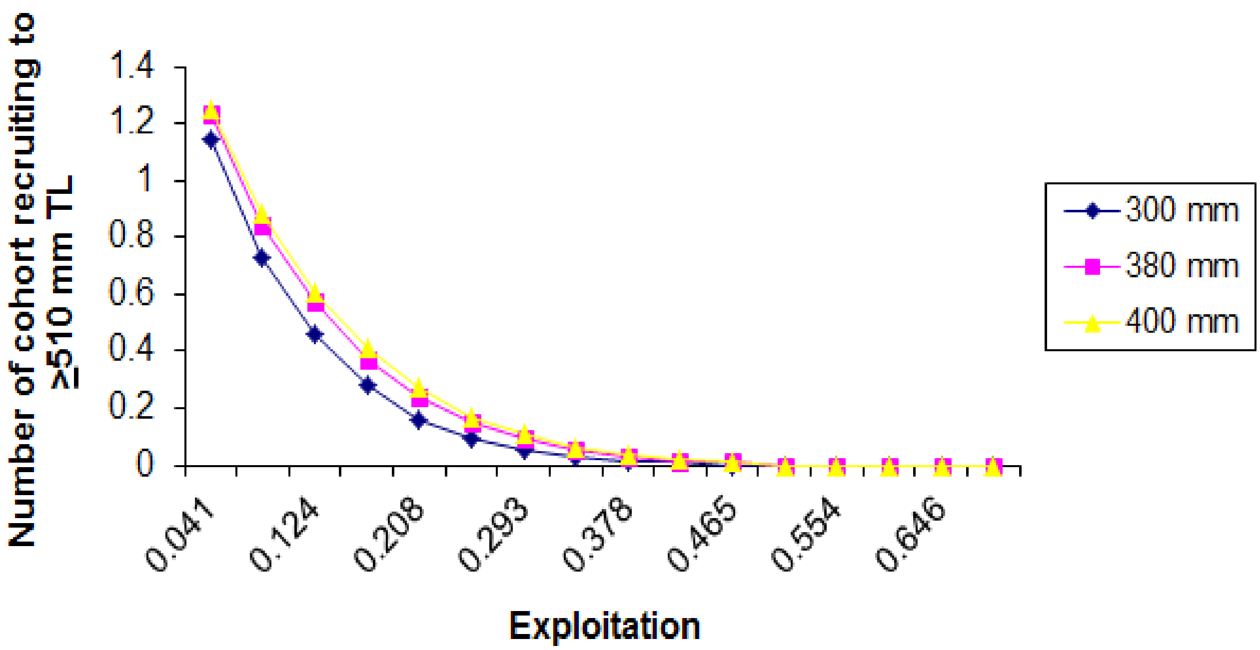

FIGURE 6. Number of largemouth bass cohort recruiting to ≥510mm TL modeled under minimum length limits of 300mm TL, 380mm TL and 400mm TL at varying rates of exploitation. Conditional natural mortality = 33%.

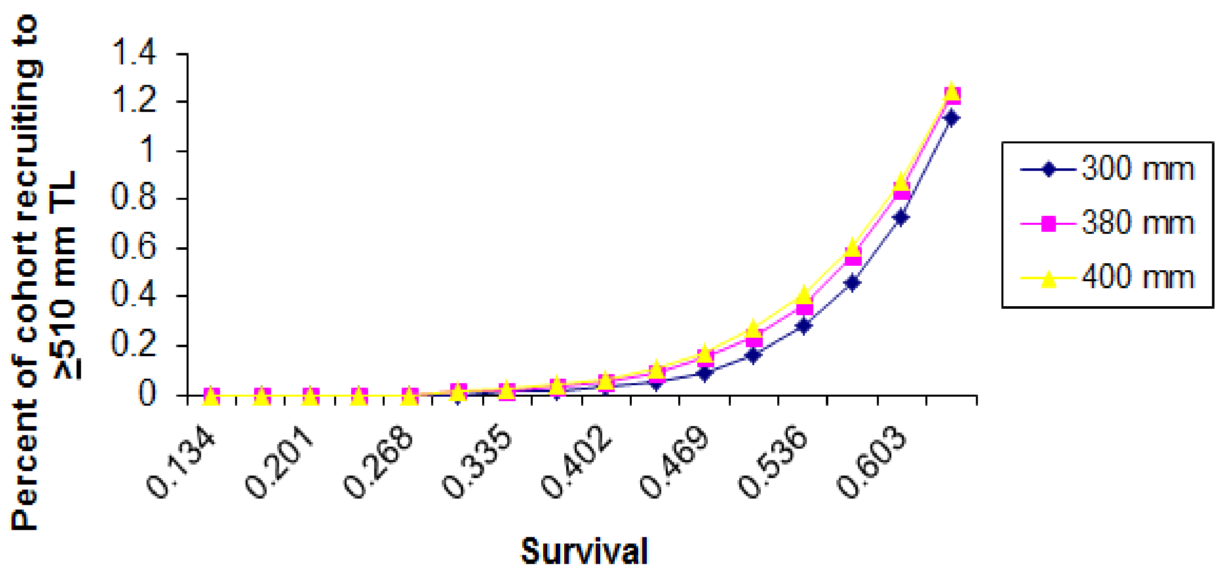

FIGURE 7. Percent of largemouth bass cohort recruiting to ≥510 mm TL at varying survival rates modeled under minimum length limits of 300 mm TL, 380 mm TL and 400 mm TL. Conditional natural mortality = 33%. Estimated annual survival rate for 2009 is 50%.

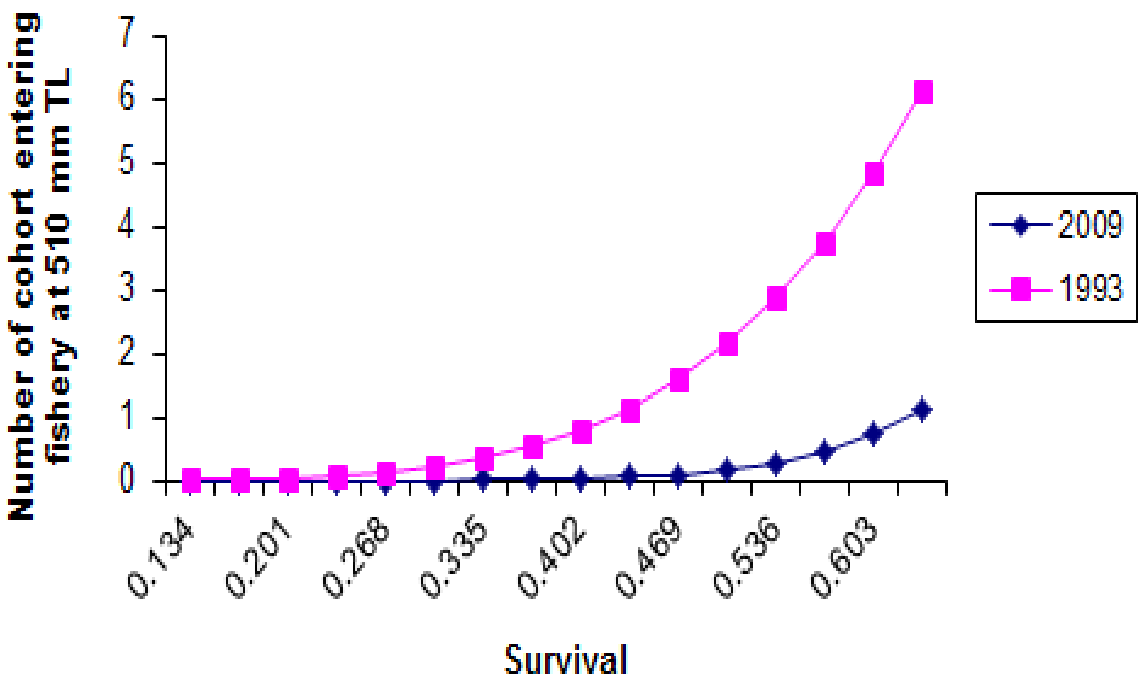

FIGURE 8. Number of a largemouth bass cohort entering the fishery at ≥ 510 mm TL at various survival rates for 2009 and 1993 modeled under a minimum length limit of 300 mm TL . Conditional natural mortality rates held constant at 33% for both years. Estimated survival rate was 73% in 1993 and 50% in 2009.