Fisheries bulletin

KENTUCKY DEPARTMENT of FISH and WILDLIFE RESOURCES

Evaluation of White Bass Stocking to Enhance Existing Reservoir Populations

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BULLETIN NO. 113
SEPTEMBER 2014

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2014
Partially funded by the Sport Fish Restoration Program
F-40

ABSTRACT

The white bass (*Morone chrysops*) is native to the southern Great Lakes, Mississippi River basin and Gulf Coastal drainages and has been widely introduced elsewhere, as they can thrive in both lentic and lotic systems and can become very abundant in reservoirs. Although widely introduced, there is no evidence in the literature of supplemental stocking of white bass to enhance an existing population. In recent years, many Kentucky reservoirs have experienced severe declines in white bass populations, including Barren River Lake and Dewey Lake. Barren River Lake and Dewey Lake were stocked with OTC-marked white bass fingerlings from 2003-2007, with the goal of boosting survival to enhance the existing reservoir populations. White bass were sampled with spring electrofishing and fall gill netting at each lake from 2003-2010. Short term post-stocking survival of white bass fingerlings was excellent; however it did not result in a sustained increasing population at either lake according to gill net sampling. There was a much higher contribution of stocked fish in the population at Dewey Lake than at Barren River Lake. Creel surveys (2004, 2007, and 2010) showed a decreasing white bass population at Barren River Lake and an increasing white bass population at Dewey Lake. White bass supplemental stocking does not appear to be effective in every situation because of the many different dynamics that can be at work in determining year class survival, as evidenced at Barren River Lake. White bass supplemental stocking can be used to provide put and take fisheries in reservoirs with a lack of spawning habitat in headwater streams as at Dewey Lake.

INTRODUCTION

The white bass (*Morone chrysops*) is native to the southern Great Lakes, Mississippi River basin and Gulf Coastal drainages and has been widely introduced elsewhere (Etnier and Starnes 1993). Populations thrive in both lentic and lotic systems and can become very abundant in reservoirs. Consequently, in many areas the species has become an important predator and sport fish (Guy et al. 2002). White bass in lentic systems exhibit spring spawning runs from the main lake to headwater areas where they become very susceptible to angling. In addition, anglers also frequently fish for the species in the summer when white bass and other piscivorous fishes are in the “jumps”… or schooled up and chasing shad on the water’s surface.

White bass populations are notorious for having highly variable recruitment (Bauer 2002, Colvin 2002a, 2002b, DiCenzo and Duval 2002, Sammons and Bettoli 2000, Schultz 2002, Willis 2002). However, the factors affecting recruitment in reservoirs are not yet completely understood (Guy et al. 2002). Some of these factors include: spring inflow (DiCenzo and Duval 2002), gizzard shad density (Schultz et al. 2002), prey type (Bauer 2002), and large scale climatic patterns (Sammons and Bettoli 2000, Willis et al. 2002).

In recent years, many Kentucky reservoirs have experienced severe declines in white bass populations, including Barren River Lake (BRL) and Dewey Lake (DWL). The cause of declines in white bass fisheries at these lakes is also unknown. BRL receives annual stockings of hybrid striped bass which may create a competitive bottleneck at some stage in their life histories. Because of the mass migrations of white bass to the headwaters of reservoirs in the spring it has also been speculated that deficiencies in physical parameters such as rainfall and/or reservoir inflow in consecutive dry years are factors that have contributed to poor year classes and the eventual decline of the white bass fishery at BRL. Even during wet years, white bass recruitment could be low at reservoirs exhibiting extreme siltation problems, such as at DWL, because the increased flow carries in more sediment, smothering eggs and impeding foraging success.

Catch rates of white bass in fall gill netting at BRL averaged 24.5 fish/net-night in the 1980’s. In a 1981 creel survey at BRL, white bass harvest accounted for 0.73 fish/acre and 0.64 lb/acre. From 1991 through 2000, fall gill netting catch rates averaged just 2.4 fish/net-night and there hadn’t been a single year averaging even 7.0 fish/net-night since 1990. More recent creel surveys were conducted at BRL in 1996 and 1999. In 1996, white bass catch was 0.17 fish/acre and harvest was 0.07 fish/acre and 0.05 lb/acre. By 1999, the catch was 0.07 fish/acre and harvest was both 0.02 fish/acre and lb/acre. Historically, there is only evidence of a low level white bass population at DWL although Johns Creek further upstream in Pike County had been noted as having good spring white bass runs. The white bass harvest in a 1975 creel survey was 0.08 fish/acre and 0.04 lb/acre and harvest was 0.13 fish/acre and 0.14 lb/acre in a 1980 creel survey. There was no mention of white bass harvest in creel surveys from 1976, 1979, 1982, 1987, and 1988. In the more recent creel surveys prior to initiating white bass stocking, white bass catch and harvest were 0.01 fish/acre and 0.01 lbs/acre in 1990 and 0.04 fish/acre were caught with a harvest of both 0.01 fish/acre and lb/acre in 1997.

Typically, resource agencies have not expended a lot of effort managing white bass populations. Realizing that white bass populations were going to undergo variable recruitment and the popularity of the fishery was often seasonal, fisheries managers often overlooked the cyclic nature of the fishery and focused management efforts on other species. Angler dissatisfaction over poor white bass populations in Kentucky reservoirs that historically had very popular fisheries has resulted in the need to try new management strategies. Although white bass have been widely introduced, there is no evidence in the literature of supplemental stocking of white bass to enhance an existing population. Through supplemental stocking of white bass, it was hypothesized that the number of fish surviving to reproductive age could be boosted to the point where the population is not only self-sustaining but provides a high-quality fishery.

STUDY SITES

BRL and DWL are US Army Corps of Engineers flood control reservoirs. BRL, completed in 1964, is a 10,000 acre impoundment of the Barren River in Allen and Barren Counties located in southwestern Kentucky. BRL has a drainage area of 940 square miles. The surrounding land-use is primarily livestock grazing. DWL, completed in 1949, is a 1,100 acre impoundment of Johns Creek in Floyd County located in eastern Kentucky. DWL has a drainage area of 207 square miles. The surrounding land is primarily forested but there is also substantial mountain-top removal coal mining activity present in the watershed. Both study lakes contain the same traditional warmwater fish species found in Kentucky, with the exception that BRL also contains two other *Morone* species. The lake is stocked annually with hybrid striped bass (*M.* chrysops x *M. saxatilis*) fingerlings (20 fish/acre) and was colonized by another Morone spp., yellow bass (*M. mississippiensis*), about the same time as this study began.

METHODS

White bass fingerlings (1.5 in) were produced at Pfeiffer and Minor Clark Fish Hatcheries and stocked for five consecutive years beginning in the spring of 2003 at BRL and DWL (Table 1). Each lake was stocked at approximately 30 fish/acre in all five years. Stocked white bass were marked as fingerlings with oxytetracycline (OTC) following methods in Brooks et al. (1994). Since BRL is also stocked with hybrid striped bass, these fish were OTC marked at the fry stage in order to help differentiate them from white bass at ages 0 and 1. OTC marking was either done in hatchery raceways prior to being loaded for stocking or on the stocking truck as it was on the way to the receiving body of water. Efficacy of the OTC marks on white bass and hybrid striped bass was checked by holding a subsample of fry or fingerlings in 0.1 acre hatchery ponds for an additional one to two months. The ponds were harvested and five to ten fish from each respective stocking cohort were sacrificed and the otoliths removed for later examination with fluorescence microscopy.

At each lake, 24 hr mortality assessments were conducted to document possible mortality of stocked fingerlings due to hauling stress. The assessments consisted of floating three 33-gallon trash barrels at a marina on each lake. The barrels had a portion of the sides removed and the area replaced with fine mesh, allowing lake water to circulate with no escapement of the walleye fingerlings. Each barrel had an opaque lid and signage stating that they were part of a KY Fish and Wildlife research study and should not be disturbed. At the time of stocking, approximately 100 fingerlings were removed from the stocking truck and placed in each of the barrels. The temperature and dissolved oxygen of water in the hauling truck and the receiving water was recorded. KDFWR personnel returned 24 hrs later and counted the number of living and dead fingerlings in each barrel. The percent mortality from each of three replicates was averaged to come up with an overall 24-hr percent mortality. Measurements of total length were taken from 100 fish to determine mean size of the stocked fish.

White bass sampling was conducted with direct current electrofishing in the headwaters of each reservoir beginning in spring 2003 at both lakes and continued through 2010. Sampling was conducted in late March or early April depending on water temperature, lake level and stream inflow. All white bass collected were measured for total length and the sex of mature white bass was documented. Otoliths were removed for age determination and later examination for OTC marks that would indicate if the fish were naturally produced or stocked fish.

Fall gill netting was also conducted at each lake in late October after thermal destratification from 2003 through 2010. Gill netting was conducted over at least two consecutive nights with a preferred minimum catch of 100 white bass. A total of eight net-nights of gill netting over two nights were conducted on BRL in 2003. Effort was increased in subsequent years; going to 18 net-nights of sampling over three nights in 2005-2006 and then 36 net-nights over three nights from 2007-2010. Effort at DWL began as 16 net-nights over two nights in 2003. DWL gill netting effort increased to 20 net-nights over two nights in 2004-2005, and then to 30 net-nights over three nights in 2006-2010. Gill nets used were 8 ft. tall experimental nets consisting of 4 – 50 ft. sections of 0.75", 1.0", 1.5" and 2.0" monofilament mesh. White bass are not fully recruited to the fall gill nets until age-1, so recruitment of stocked fish to the population was based on the catch rates of age-1 OTC marked white bass in fall gill net samples. Otoliths were removed from all suspected age-1 Morone sp. (BRL: 9-12 in classes; DWL: 7-12 in classes) and at least 10 fish per inch class of other sizes to get a general age sample. The presence of a fry mark, fingerling mark, or the absence of a mark allowed for the differentiation of stocked white bass, stocked hybrid striped bass and naturally spawned white bass. The recruitment of stocked fish to the reproducing stock was also analyzed by examining the proportion of mature OTC marked fish in spring electrofishing and fall gill net samples.

Creel surveys were conducted on both BRL and DWL at three year intervals during the course of the study (2004, 2007 and 2010). Creel surveys generally began in late March or early April and ran through the end of October. A roving creel survey design was used with all areas have equal probabilities. The creel clerk surveyed 10 weekdays and 6 weekend days during all months. Creel survey periods were half days in all months and also had equal probabilities. In conjunction with the creel survey, the creel clerk also administered a survey to query anglers as to their satisfaction with the fishery and their experience.

RESULTS AND DISCUSSION

Green River Lake (8,210 acres) and Taylorsville Lake (3,050 acres) were used as control lakes for the study and so were not stocked with white bass. However, it was decided that data from these lakes would not add to the limited analysis of the treatment lakes data and so control lakes data will not be discussed.

Stocking Mortality

The 24-hr mortality assessments that were conducted at each white bass stocking showed that there was excellent short-term survival. Survival of stocked white bass in these experiments averaged 91% at BRL with a range of 76 to 97% and averaged 98% at DWL with a range of 96 to 100% (Table 1). The fact that these fish had already undergone OTC marking, which in itself is a stressful event, may mean that the weakest fish may have already been culled (Ron Brooks, personal communication). Based on the high short-term survival rates, the assumption was made that stocked white bass could have equivalent survival to naturally produced fish of the same size. However, the average size of white bass fingerlings was less than the 1.5-in goal in four out of five years for BRL and two out of five years at DWL and it is unknown what role this may have had in the survival of the stocked fish.

Barren River Lake

Spring spawning migrations of white bass out of reservoirs and into headwaters concentrates the fish near riffles making them susceptible to electrofishing. Because of the nature of this sampling (during a spawning migration), spring electrofishing catch rates should not be expected to be well correlated with fall gill net catch rates. Spring catch rates of white bass in the Barren River above BRL generally were higher in the first four years of the project (2003-2006) than in the last three years (2008-2010) (Figure 1). The relatively higher number observed were not related to the supplemental stocking of white bass as the relative lack of OTC-marked fish indicated the vast majority of these fish were natural. The stocked fish from the 2003 cohort first began showing up in the spring sample in 2005 as represented by a few age-2 fish in the 10-12 in classes (Figure 1). This was apparently on top of a strong natural year class, as all fish collected and aged that were between 10.0 and 13.3 in were age-2. White bass at BRL average 7.6 in, 12.0 in, and 14.0 in at ages 1-3 (Tables 2 and 3). This same stocked year class was represented by just two age-3 fish in the spring 2006 sample. The only other stocked fish seen in spring samples were age-1 and 2 stocked fish present in the spring 2008 sample, though again in low numbers. The hatchery efficacy tests of OTC marking of white bass showed that all marked fish had readily discernible marks. OTC marks were also easily distinguishable on transverse-sectioned white bass otoliths from up to age-6 wild fish and there is no reason to believe they could not be seen on otoliths from white bass of any age.

Fall gill net catch rates at BRL were highly variable over the eight years of the project and there was no discernible increasing trend that would correlate with stocking. Catch rates ranged from 0.6 fish/nn to 10.6 fish/nn with the highest catch rates in the first two years and the last year of the project (Table 4). Average catch rate over the eight years of the study was 3.3 fish/nn, which is slightly higher than the 2.4 fish/nn observed in the previous ten years at the lake. Gill net catches also showed low contribution of stocked fish from the five years of stocking, as the percent contribution of age-1 stocked fish ranged from 0.0 to 35.3% and averaged 15.7% (Table 5). In 2006 and 2008, no age-1 white bass were collected, natural or stocked, suggesting either complete failure of the 2005 and 2007 year classes or the lack of a representative gill net sample. The mean length of stocked fish and natural fish at BRL was similar except in 2004 when stocked age-1 fish were longer than natural fish (p=0.03).

In a general sense, a low relative contribution of stocked fish to a year class could happen with good survival of stocked fish when there is a strong natural year class. This was not the case at BRL, as there was low contribution to relatively low year classes.

The condition of white bass in fall gill nets at BRL from 2003-2010 was variable, with overall condition ranging from 85-99 (Table 6). The only noticeable pattern was that relative weight was generally lowest during 2003-2005. White bass of all size classes had lower condition in these three years than in other years. This disparity was not likely due to white bass supplemental stocking because, as has been noted, few stocked white bass were present in the population during these years. The hybrid striped bass population was probably not a factor either, as densities fluctuated up and down during these years. Though there is no direct evidence of competitive interactions, yellow bass were first found to have colonized the lake in 2003 when they were present in good numbers alongside white bass during spring electrofishing of BRL headwaters.

During the course of the BRL study, there was some concern that gill nets did not routinely catch a representative sample of the white bass population. With the exception of 2004 and 2005, the gill net catch was dominated by fish less than 9 inches. This fact contrasts with very high catch rates of greater than 9 in white bass during spring 2005 and 2006 electrofishing. The increased gill netting effort instituted from 2005-2010 did not seem to provide a better representative sample of white bass.

Creel survey results from BRL in 2004, 2007 and 2010 indicate a declining white bass population (Table 7). The number of white bass caught/acre went from 1.75 fish/acre in 2004 to 0.05 in 2007 and 0.01 in 2010. There were zero white bass harvested in the 2007 and 2010 creel surveys. There was an even greater decline in the number of hybrid striped bass caught and harvested over the same time period. In contrast, yellow bass numbers caught and harvested increased over the same time period. Not surprisingly, there was a decrease in fishing effort targeting *Morone* spp. and decrease in percent fishing success (Table 7).

<u>Dewey Lake</u>

The headwaters of DWL (Johns Creek) were first sampled for this project in spring 2003. No white bass were collected (Figure 2). The spawning run could have been missed but sampling was conducted on 26 March 2003 when water temperatures were 59-60 °F and within the prescribed sampling window. Adequate samples of white bass were collected with spring electrofishing in all other years with the exception of 2007, when sampling was delayed due to high, turbid water conditions and only five fish were collected. Electrofishing catch rates of white bass were highest from 2008-2010. As at BRL, stocked white bass first appeared in 2005 spring sampling at DWL with both the 2003 and 2004 stocked white bass present. White bass growth rates are slower at DWL than those at BRL (Tables 8 and 9) as they average 6.5 in, 11.2 in, and 13.0 in at ages 1-3. Because of the slower growth rates, stocked white bass were a major component of the reproductive stock through completion of the project in 2010, even though stocking concluded in 2007. Stocked fish still were the majority of the spring 2010 sample, even though the last of the stocked fish were cycling through the population.

Fall gill net catch rates of white bass at DWL ranged from 1.9 fish/nn to 5.4 fish/nn with the highest catch rates in 2003, 2004, 2008, and 2010 (Table 10). Like BRL, and in contrast to spring electrofishing catch rates, there was no discernible trend of an increasing white bass population with supplemental stocking based on gill net catches. As noted above and also in contrast to BRL, stocked fish were relatively heavy contributors to the DWL white bass population. The percent contribution of age-1 stocked fish ranged from 50 to 100% and averaged 78.3% (Table 5). In 2005 and 2007, few age-1 white bass were collected suggesting relatively poor 2004 and 2006 year classes. The mean length of stocked fish and natural fish at DWL was similar except in 2006 when stocked age-1 fish were longer than natural fish ($p=0.02$). It is noteworthy that the highest gill net catch of age-0 white bass (5.5 -8.6 in) was in 2010 (Table 10), meaning there was good survival of a natural year class in the last year of the study.

The overall condition of white bass in fall gill netting at DWL from 2003-2010 ranged from 89-99 (Table 11). White bass condition at DWL tended to be higher during the first four years of the project than the last four years.

In contrast to BRL, creel surveys at DWL showed an increasing white bass population. Anglers caught few white bass during 2004 and 2007 and did not harvest any those two years. No anglers were specifically targeting white bass in either year (Table 12). However, 1.28 fish/acre were caught in 2010 and 0.63 fish/acre were harvested. There were 45 trips targeting white bass in the 2010 creel survey, but this was 1.2% of all trips. White bass anglers had very good success in 2010 (56.3%).

CONCLUSIONS

White bass supplemental stocking does not appear to be effective in every situation because of the many different dynamics that can be at work in determining year class survival, as evidenced at BRL. There does not appear to be a shortage of spawning habitat in the headwaters of BRL, but the white bass population, as sampled by gill nets, remained low during the course of this research despite the supplemental stocking. Over the five years of white bass stocking, there was a low contribution of stocked fish at BRL. This could be due to competition with other *Morone* spp. present at BRL, but determining interspecific competition was beyond the scope of this study.

White bass supplemental stocking can be used to provide put and take fisheries in reservoirs with a lack of spawning habitat in headwater streams as at DWL. White bass populations are usually dominated by two and three old fish so a good year class is needed every third year to maintain a fishable population. Contribution of stocked fish was generally high at DWL, although year class strength was variable. The supplemental stocking did lead to a white bass population of reproductive size at DWL after 2005. The excellent natural spawning that produced the 2010 year class is evidence that a reproducing white bass population had been re-established.

MANAGEMENT RECOMMENDATIONS

If it is desired to maintain a white bass population at DWL, it should be monitored and supplemental stocking should occur as needed. This procedure could also be used at other reservoirs with compromised headwater streams.

Like most research, the results of the current study lead to more questions that could be the basis for future research:

1. Design a study to compare gill netting with other sampling methods to determine white bass sampling effectiveness.
2. It would also be helpful to know, after white bass are hatched, how quickly and at what size white bass fry/fingerlings migrate back to the lake? The answer to these questions may help to better tailor our stockings.
3. Design a bioenergetics study to determine if there is competition among *Morone* spp. at BRL and at what size there may be a bottleneck. These results may answer the question if white bass and hybrid striped bass populations could both flourish with alternate year stocking.

ACKNOWLEDGEMENTS

I would like to thank the personnel of the Eastern and Southwestern Fisheries Districts for their assistance with electrofishing and gill netting in association with this project and also for being willing to conduct stocking mortality assessments. I am also grateful for the assistance of Lake Fisheries Research fisheries technicians, Jason Russell and David Baker, both in the field and in the lab. Special thanks also to Don Bunnell and Ryan Oster for regular gill netting assistance and the multitude of other fisheries personnel that helped in the field. I appreciate the advice of Gerry Buynak throughout this project and for his comments and those of Jeff Ross to improve this manuscript.

REFERENCES

Bauer, D. L. 2002. White bass population differences in Nebraska Reservoirs with gizzard shad or alewife prey bases. North American Journal of Fisheries Management 22:665-670.

Brooks, R. C., R. C. Heidinger, and C. C. Kohler. 1994. Mass-marking otoliths of larval and juvenile walleyes by immersion in oxytetracycline, calcein, or calcein blue. North American Journal of Fisheries Management 14:143-150.

Colvin, M. A. 2002a. A comparison of gill netting and electrofishing as sampling techniques for white bass in Missouri's large reservoirs. North American Journal of Fisheries Management 22:690-702.

Colvin, M. A. 2002b. Population and fishery characteristics of white bass in four large Missouri reservoirs. North American Journal of Fisheries Management 22:677-689.

DiCenzo, V. J., and M. C. Duval. 2002. Importance of reservoir inflow in determining white bass year-class strength in three Virginia reservoirs. North American Journal of Fisheries Management 22:620-626.

Etnier, D. A., and W. C. Starnes. 1993. The fishes of Tennessee. University of Tennessee Press, Knoxville.

Guy, C. S., R. D. Schultz, and M. A. Colvin. 2002. Ecology and management of white bass. North American Journal of Fisheries Management 22:606-608.

Sammons, S. M., and P. W. Bettoli. 2000. Population dynamics of a reservoir sport fish community in response to hydrology. North American Journal of Fisheries Management 20:791-800.

Schultz, R. D., C. S. Guy, and D. A. Robinson, Jr. 2002. Comparative influences of gizzard shad catch rates and reservoir hydrology on recruitment of white bass in Kansas reservoirs. North American Journal of Fisheries Management 22:671-676.

Willis, D. W., C. P. Paukert, B. G. Blackwell. 2002. Biology of white bass in eastern South Dakota glacial lakes. North American Journal of Fisheries Management 22:627-636

Table 1. Number and mean length of white bass stocked in Barren River and Dewey lakes from 2003 to 2007.

Lake	Stocking Date	Number stocked	Length (in)	No./acre	24-hr mortality (%)
Barren River Lake	June-03	352,412	1.4	35.2	24.2
Barren River Lake	June-04	304,482	1.3	30.4	2.9
Barren River Lake	June-05	302,960	1.3	30.3	5.2
Barren River Lake	June-06	309,811	1.3	31.0	7.5
Barren River Lake	June-07	226,643	1.7	22.7	6.0
Dewey Lake	June-03	33,747	1.4	30.7	2.2
Dewey Lake	June-04	37,145	1.2	33.8	1.4
Dewey Lake	June-05	36,300	1.7	33.0	4.1
Dewey Lake	June-06	38,076	1.6	34.6	0.0
Dewey Lake	June-07	33,000	1.6	30.0	1.2

Table 2. Mean back-calculated lengths (in) at each annulus for white bass collected from Barren River Lake in October 2004, including 95% confidence interval for mean length per age class. Age determined from otoliths.

		Age		
Year	No.	1	2	3
2003	24	7.1		
2002	13	8.4	11.9	
2001	3	8.7	12.5	14.0
Mean		7.7	12.0	14.0
Number	40			
Smallest		4.7	10.8	13.5
Largest		9.7	13.5	14.8
Std error		0.2	0.2	0.4
95% Con low		7.3	11.7	13.3
95% Con hi		8.0	12.4	14.8

Table 3. Age frequencies and CPUE of white bass collected in experimental gill nets fished for 9 net-nights on Barren River Lake from October 26-27, 2004.

	Inch Class														Std.
Age	5	6	7	8	9	10	11	12	13	14	15	Total	%	CPUE	Error
0+	4	9	31	4								48	53	5.3	1.41
1+					2	3	19	1				25	28	2.8	0.82
2+								3	7	4		14	16	1.6	0.56
3+										1	2	3	3	0.3	0.14
Total	4	9	31	4	2	3	19	4	7	5	2	90		10.0	
%	4	10	34	4	2	3	21	4	8	6	2		100		

Table 4. Fall gill net CPUE (fish/nn) for four size classes of white bass from Barren River Lake from 2003-2010.

	Size Class									
	< 6.0 in		6.0-8.9 in		9.0-11.9 in		≥ 12.0 in		Total	
Year	CPUE	Std. Error	CPUE	Std. Error	CPUE	Std. Error	CPUE	Std. Error	CPUE	Std. Error
2003	0.25	0.16	2.25	0.67	1.63	0.50	0.13	0.13	4.25	1.03
2004	0.44	0.24	5.33	1.05	2.78	0.78	2.00	0.67	10.56	1.86
2005	0.17	0.12	0.22	0.10	1.11	0.37	0.39	0.14	1.89	0.44
2006	0.11	0.08	0.61	0.26	-		-		0.72	0.28
2007	0.08	0.05	1.67	0.52	0.42	0.15	0.08	0.05	2.25	0.58
2008	-		1.66	0.35	0.11	0.07	-		1.77	0.38
2009	-		0.11	0.07	0.19	0.08	0.33	0.13	0.64	0.19
2010	-		3.36	1.38	0.56	0.2	0.50	0.23	4.42	1.75
Average									3.31	

Table 5. Relative number, mean length, and percent contribution of natural and stocked white bass at age-1+ in fall gill net samples from Barren and Dewey Lakes from 2004-2010. Standard error is in parentheses.

		Natural		Stocked		% contribution of
Lake	Sample year	No. of fish	Mean length (in)	No. of fish	Mean length (in)	stocked fish to year class
Barren River Lake	2004	19	11.1 (0.13)	6	11.6 (0.13)	24.0
Barren River Lake	2005	21	11.3 (0.11)	5	11.5 (0.12)	19.2
Barren River Lake	2006	0		0		0.0
Barren River Lake	2007	11	11.4 (0.11)	6	11.0 (0.26)	35.3
Barren River Lake	2008	0		0		0.0
Barren River Lake	2009	19	12.2 (0.14)	N/A		N/A
Barren River Lake	2010	2	11.5 (0.15)	N/A		N/A
Dewey Lake	2004	2	10.1 (0.60)	36	9.6 (0.21)	94.7
Dewey Lake	2005	1	11.6	1	9.6	50.0
Dewey Lake	2006	9	10.6 (0.24)	42	11.4 (0.18)	82.4
Dewey Lake	2007	0		7	10.5 (0.39)	100.0
Dewey Lake	2008	15	10.5 (0.13)	27	10.4 (0.09)	64.3
Dewey Lake	2009	5	11.9 (0.17)	N/A		N/A
Dewey Lake	2010	26	11.1 (0.12)	N/A		N/A

Table 6. Number of fish and the relative weight (Wr) for three size classes of white bass collected at Barren River Lake in fall gillnets from 2003-2010.

	Size Class											
	6.0-8.9 in			9.0-11.9 in			≥ 12.0 in			Total		
Year	No.	Wr	Std. erro	No.	Wr	Std. erro	No.	Wr	Std. erro	No.	Wr	Std. erro
2003	19	89	2.0	12	90	2.6	1	90		32	89	1.5
2004	48	88	1.1	25	91	1.0	18	89	1.2	91	89	0.7
2005	4	87	2.5	20	85	1.6	7	85	1.8	31	85	1.1
2006	10	99	3.0	-			-			10	99	3.0
2007	58	99	3.2	14	88	1.7	3	79	2.8	75	96	2.6
2008	57	94	1.1	3	101	5.4	-			60	95	1.1
2009	4	92	4.5	7	91	3.8	12	95	2.5	23	93	1.8
2010	121	97	0.7	20	100	1.7	18	89	1.3	159	96	0.6

Table 7. Comparison of Morone spp. statistics derived from daytime creel surveys on Barren River Lake during 2004, 2007, and 2010.

	2004			2007				2010			
	White bass	Hybrid striped bass	Morone group	White bass	Hybrid striped bass	Yellow bass	Morone group	White bass	Hybrid striped bass	Yellow bass	Morone group
Number of fish caught	17,460	54,199		529	12,941	1,867		111	8,047	5,134	
Number of fish caught/acre	1.75	5.42		0.05	1.29	0.19		0.01	0.80	0.51	
Number of fish harvested	3,420	39,129		0	5,247	132		0	3,987	788	
Number of fish harvested/acre	0.34	3.91			0.52	0.01			0.40	0.08	
Percent of total number harvested	1.1	12.3			14.8	0.4			6.7	1.3	
Pounds harvested	2,305	81,544			10,199	21			8,117	136	
Pounds harvested/acre	0.23	8.15			1.02	0.00			0.81	0.01	
Percent of total pounds harvested	1.0	34.5			23.9	0.1			19.0	0.3	
Mean length (in)	11.8	16.6			15.3	7.8			16.4	7.7	
Mean weight (lbs)	0.68	2.61			1.87	0.19			2.38	0.18	
Number of fishing trips for group			19,652				5,434				4,322
Percent of all trips			21.1				11.6				10.3
Hours fishing for group			100,950				14,840				18,141
Number harvested fishing for group			40,428				4,378				3,673
Pounds harvested fishing for group			81,839				9,710				7,113
Number/hour harvested for group			0.43				0.34				0.28
Percent success fishing for group			41.6				25.7				19.7

Table 8. Mean back-calculated lengths (in) at each annulus for white bass collected from Dewey Lake in October 2004, including 95% confidence interval for mean length per age class. Age determined from otoliths.

		Age						
Year	No.	1	2	3	4	5	6	7
2003	38	5.7						
2002	18	7.5	11.3					
2001	16	6.9	11.3	13.0				
2000	2	7.6	11.4	13.1	14.2			
1999	6	7.1	10.3	12.5	13.7	14.3		
1998	1	7.5	12.0	13.9	14.3	15.0	15.2	
1997	1	6.2	10.8	13.0	13.8	14.5	15.0	15.5
Mean		6.5	11.2	13.0	13.9	14.4	15.1	15.5
Number	82							
Smallest		3.8	8.4	10.3	11.2	11.8	15.0	15.5
Largest		9.2	12.8	14.4	14.9	15.6	15.2	15.5
Std error		0.1	0.1	0.2	0.3	0.4	0.1	
95% Con low		6.3	10.9	12.6	13.2	13.6	14.9	
95% Con hi		6.8	11.4	13.3	14.5	15.3	15.3	

Table 9. Age frequencies and CPUE of white bass collected in experimental gill nets fished for 19 net-nights on Dewey Lake from November 3-4, 2004.

	Inch Class															Std.
Age	5	6	7	8	9	10	11	12	13	14	15	16	Total	%	CPUE	Error
0+	6	7	4	2									19	19	1.0	0.29
1+			3	11	10	10	2	2					38	38	2.0	0.35
2+						1		2	10	5			18	18	0.9	0.23
3+								1	4	7	4		16	16	0.8	0.23
4+										1	1		2	2	0.1	0.03
5+								1		2	2	1	6	6	0.3	0.11
6+											1		1	1	0.1	0.02
7+											1		1	1	0.1	0.02
Total	6	7	7	13	10	11	2	6	14	15	9	1	101		5.3	
%	6	7	7	13	10	11	2	6	14	15	9	1		100		

Table 10. Fall gill net CPUE (fish/nn) for four size classes of white bass from Dewey Lake from 2003-2010.

	Size Class									
	< 6.0 in		6.0-8.9 in		9.0-11.9 in		≥ 12.0 in		Total	
Year	CPUE	Std. Error	CPUE	Std. Error	CPUE	Std. Error	CPUE	Std. Error	CPUE	Std. Error
2003	0.63	0.22	1.13	0.47	0.75	0.37	1.13	0.26	3.63	0.83
2004	0.32	0.13	1.42	0.31	1.21	0.25	2.37	0.61	5.32	0.82
2005	0.59	0.21	0.94	0.25	0.18	0.10	0.24	0.18	1.94	0.42
2006	0.10	0.07	0.90	0.36	1.30	0.39	0.43	0.16	2.73	0.54
2007	0.28	0.13	0.28	0.13	0.93	0.18	1.10	0.35	2.59	0.51
2008	-		0.97	0.34	2.97	0.59	1.43	0.43	5.37	1.03
2009	0.13	0.06	0.67	0.18	0.13	0.08	1.10	0.43	2.03	0.47
2010	0.07	0.05	2.62	0.48	0.86	0.23	0.38	0.16	3.93	0.56

Table 11. Number of fish and the relative weight (Wr) for three size classes of white bass collected at Dewey Lake in fall gill nets from 2003-2010.

	Size Class											
	6.0-8.9 in			9.0-11.9 in			≥12.0 in			Total		
Year	No.	Wr	Std. error	No.	Wr	Std. error	No.	Wr	Std. error	No.	Wr	Std. error
2003	18	96	1.6	12	94	1.8	18	99	1.5	48	96	1.0
2004	27	88	1.0	23	90	2.3	45	99	0.9	95	94	0.9
2005	16	97	2.1	3	97	3.0	4	109	1.5	23	99	1.8
2006	27	97	0.9	39	93	1.2	13	102	1.4	79	96	0.8
2007	8	86	2.9	27	86	1.3	32	92	1.0	67	89	0.9
2008	29	93	0.8	71	87	0.6	42	92	1.3	142	90	0.6
2009	20	94	1.8	4	85	3.3	33	93	0.9	57	93	0.9
2010	76	96	0.7	25	92	1.2	11	92	1.9	112	94	0.6

Table 12. Comparison of Morone spp. statistics derived from daytime creel surveys on Dewey Lake during 2004, 2007, and 2010.

	2004		2007		2010	
	White bass	Morone group	White bass	Morone group	White bass	Morone group
Number of fish caught	31		166		1,410	
Number of fish caught/acre	0.03		0.15		1.28	
Number of fish harvested	0		0		690	
Number of fish harvested/acre					0.63	
Percent of total number harvested					4.9	
Pounds harvested					390	
Pounds harvested/acre					0.35	
Percent of total pounds harvested					4.6	
Mean length (in)					10.1	
Mean weight (lbs)					0.48	
Number of fishing trips for group		0		0		45
Percent of all trips						1.2
Hours fishing for group						311
Number harvested fishing for group						652
Pounds harvested fishing for group						377
Number/hour harvested for group						1.55
Percent success fishing for group						56.3

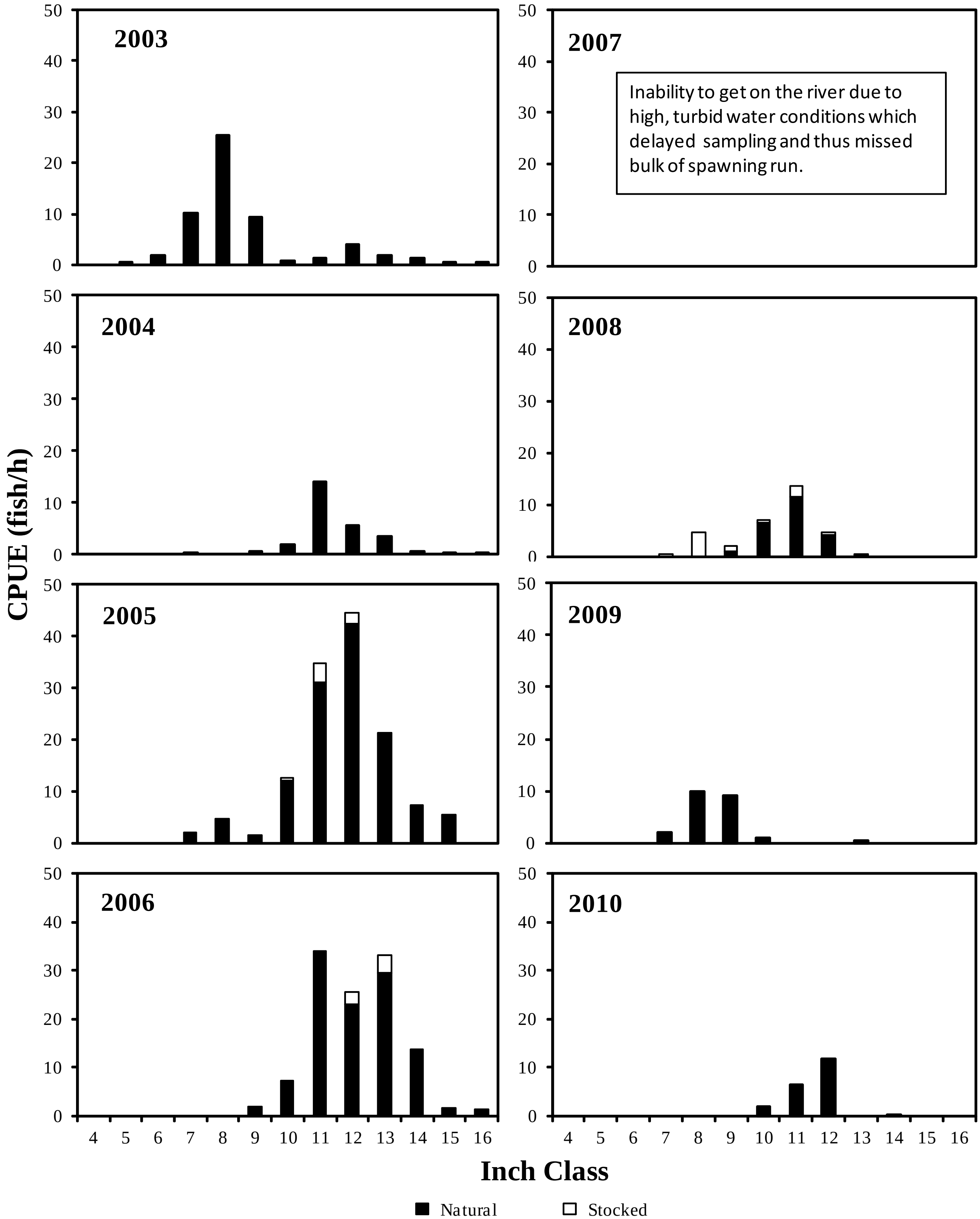

Figure 1. Spring electrofishing CPUE (fish/h) of natural and stocked white bass by inch class in the Barren River Lake headwaters from 2003 to 2010.

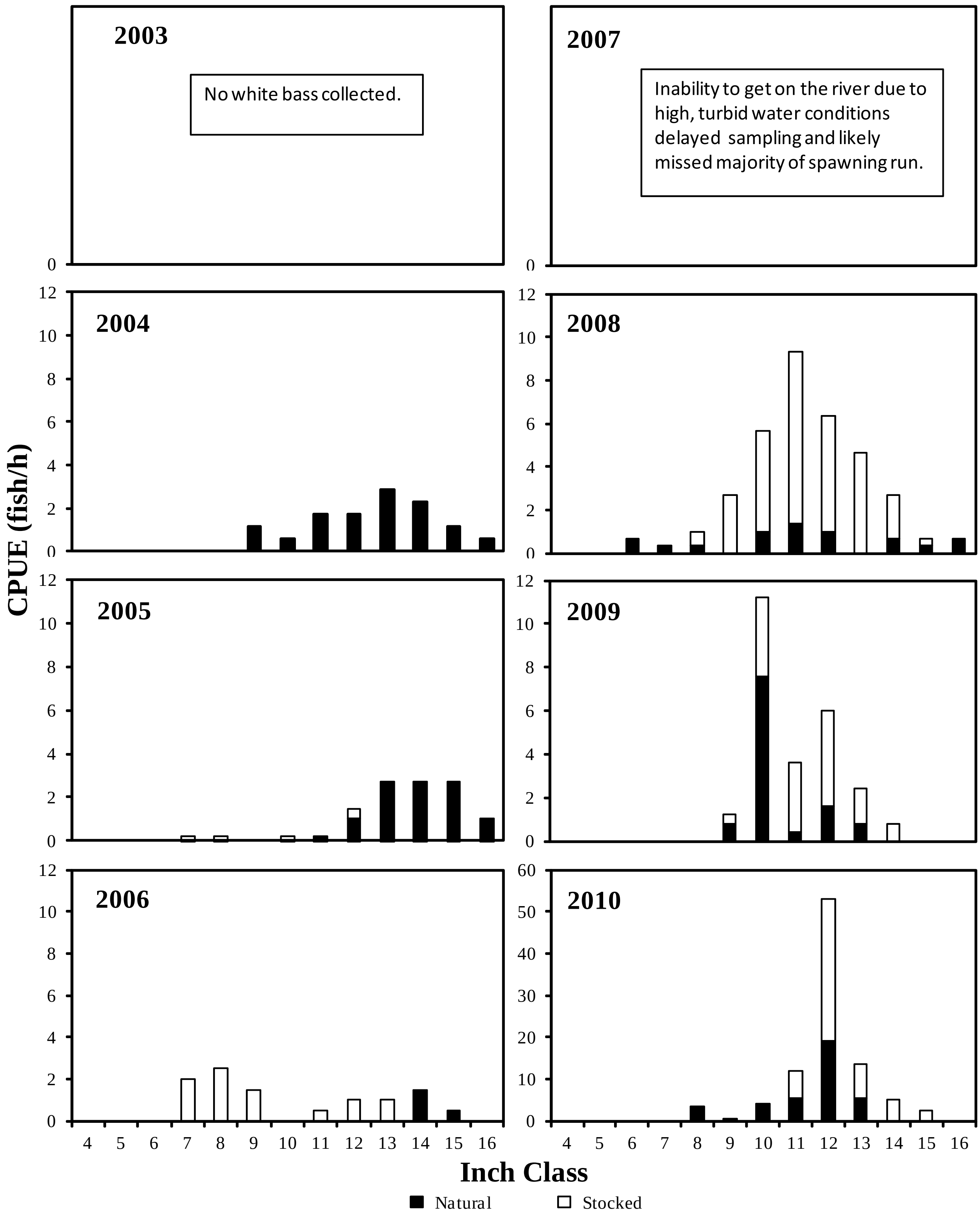

Figure 2. Spring electrofishing CPUE (fish/h) of natural and stocked white bass by inch class in the Dewey Lake headwaters from 2003 to 2010. Note scale change on y-axis for 2010 sample.