

Fisheries Session

Evaluation of Striped Bass and Hybrid Striped Bass Stockings in Eight Alabama Public Fishing Lakes

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Abstract: Stockings of striped bass, (*Morone saxatilis*), hybrid striped bass, (*Marone saxatilis* x *Marone chrysops*), and reciprocal hybrid striped bass (*Morone chrysops* x *Morone saxatilis*), at Alabama's public fishing lakes were evaluated. Age and growth data are presented for each of the 3 groups. The length-weight relationship developed for hybrid striped bass from Alabama's public fishing lakes is $\text{Log}_{10} \text{ weight} = -4.9549 + 3.033 (\text{Log}_{10} \text{ length})$. The condition factor K_n for hybrid striped bass from these lakes was very low, relative to hybrid striped bass from West Point Reservoir. Survival of hybrid striped bass at one lake from age 1 to age 2 was over 30% . A cost-benefit ratio from the cost of stocking these fish divided by the benefit to fishermen from harvesting them produced a value near 1.

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Interest in striped bass and their various hybrids has developed ever since initial studies showed that they could survive and grow in landlocked impoundments (Surber 1957). Their potential as sport fish and ability to control shad populations while not competing directly with other natural predators, such as the largemouth bass, *Micropterus salmoides*, was attractive to both fishermen and biologists.

Since the first introduction of hybrid striped bass in 1965 (Stevens 1965), these particular fish have been reported to have higher survival rates than striped bass in hatchery ponds (Logan 1967); Ware (1974) also found that the growth of hybrids in reservoirs was greater than that of striped bass during the first 18 months to 2 years of life.

The Alabama Game and Fish Division operates and manages 20 state-

owned public fishing lakes. Thirteen of these lakes ranging in size from 18 to 74 ha have received stockings of striped bass, hybrid striped bass, reciprocal hybrid striped bass, or combinations of 2 of the above 3 groups since the first stocking in 1971. Many of these public fishing lakes have received from 20 to 25 striped bass or hybrids per acre per year depending upon hatchery production and availability. This paper will evaluate these stockings by considering some aspects of age and growth of these fish and the cost-benefit ratio of these stockings.

Methods

Sampling Procedures

During the period from July 1977 through December 1980, samples from 819 striped bass, hybrid striped bass, and reciprocal striped bass were collected from 8 Alabama public fishing lakes located in Chambers, Coffee, Crenshaw, Dallas, DeKalb, Madison, Pike, and Walker counties. Lengths and weights were recorded, and scale samples were removed for age and growth analyses. Fishery biologists of the Alabama Game and Fish Division were responsible for sampling lakes with gill nets following the procedures established by the Striped Bass Committee of The American Fisheries Society (Southern Division). Three gill nets of various mesh sizes (19.1 mm, 31.8 mm, and 50.8 mm) were set at bimonthly intervals during the months of October-December in each lake. In addition, lake concessionaires were briefed on the project objectives and were required to record lengths and weights and collect scale samples from all hybrids and striped bass which appeared in the daily creel.

Analyses

Scale samples were aged by the Resources Branch of the Fisheries Division, Department of Northern Saskatchewan, Canada. Statistical analysis was performed by Dr. William Davies (Department of Fisheries and Allied Aquaculture, Auburn University, Auburn, Alabama). A direct proportional relationship was used to back calculate the length of fish at annulus formation for each of the project lakes (Carlander 1981). Growth was compared across lakes and among groups to determine possible differences. Survival of hybrid striped bass from age 1 to age 2 was calculated for fish from DeKalb County Public Lake. A length-weight relationship was calculated for hybrid striped bass from Alabama's Public Fishing Lakes. Condition factors (K_n) were calculated by comparing hybrid striped bass from these public lakes to hybrid striped bass from West Point Reservoir (LeCren 1951).

A cost benefit ratio was calculated to compare the benefits to the angling public of striped bass and hybrids in public lakes, as opposed to the relative

high cost of producing these fish. Cost estimations were based on brood fish procurement, rearing, and stocking expenses. Benefits were determined by calculating monetary values for striped bass and hybrids harvested by fishermen.

Description of Public Fishing Lakes

Alabama's public fishing lakes were constructed at various locations in the state having insufficient streams or lakes to meet the needs of the fishing public. Consequently, these 20 lakes receive very heavy fishing pressure. From October 1, 1980-September 30, 1981, a total of 163,047 fishermen trips were recorded. The total number of fish harvested during this period was 390,369 weighing 85,921 kg. Developed initially as a largemouth bass-bluegill (*Lepomis macrochirus*) fishery, these lakes now provide anglers with the opportunity to harvest numerous other species such as channel catfish (*Ictalurus punctatus*), blue catfish (*Ictalurus nebulosus*), and hybrid striped bass. A total of 139,049 striped bass and hybrid striped bass have been stocked in 13 of the lakes having a total of 536 ha (Table I).

Management practices which include liming and fertilization programs increase productivity and control unwanted aquatic vegetation. Creel limits, balance checks, and other routine management techniques are practiced to help maintaining desirable population structures for quality fishing. Powell (1975) provided a more detailed description of Alabama's public fishing lakes and management procedures.

Results and Discussion

Of the 607 fish age 1 or older which provided data for the statistical analysis, 519 were hybrid striped bass, 66 were reciprocal hybrid striped bass, and 22 were striped bass. Over 60% of the hybrids (326) were from DeKalb County Public Lake. The remaining 193 hybrids came from the other 7 lakes. These remaining lakes produced from 4 to 67 hybrids each. The 66 reciprocal hybrid striped bass came from 2 lakes: Coffee (42) and

Table 1. Stockings of Striped Bass and Hybrids of Striped Bass in 13 Alabama Public Fishing Lakes 1971--1981

Fingerling Striped Bass	14,725
Advanced Fingerling Striped Bass	6,120
Fingerling Hybrid Striped Bass	110,080
Advanced Fingerling Hybrid Striped Bass	5,526
Fingerling Reciprocal Hybrid Striped Bass	2,598
TOTAL	139,049

Pike (2'). The 2 striped bass were collected from Dallas (15), DeKalb (2), and Walker (5).

No statistically significant differences ($P > 0.05$) in growth were observed between hybrids from any of the lakes at annulus 1, 2, or 3; no difference was observed between reciprocal hybrid striped bass from Coffee and Pike County Lakes at annulus 1, 2, or 3; likewise, no differences were observed between hybrid striped bass from all lakes, reciprocal hybrid striped bass from all lakes, and striped bass from all lakes.

Average back calculated lengths for hybrid striped bass at annulus 1 through 4 was 230, 353, 464, and 546 mm respectively (Tables 2-4). Although these lakes are fertilized on a regular basis, growth of hybrid striped bass in Alabama's public lakes was only moderate when compared to growth histories elsewhere. Growth of hybrid striped bass from these lakes was less than the rate reported for age 1 hybrid striped bass at Clark Hill Reservoir in South Carolina and less than the rate reported for age 2 fish from Clark Hill Reservoir and Lake Hartwell. Growth was faster than that reported for

Table 2. Back-Calculated Lengths of Hybrid Striped Bass from Alabama's Public Fishing Lakes

Age	Number of Fish	Back-Calculated Length (mm) at Annulus			
		1	2	3	4
4	20	235	379	477	545
3	46	221	366	458	
2	99	226	341		
1	353	232			

Table 3. Back-Calculated Lengths of Striped Bass from Alabama's Public Fishing Lakes

Age	Number of Fish	Back-Calculated Length (mm) at Annulus	
		1	2
2	14	247	377
1	6	244	

Table 4. Back-Calculated Lengths of Reciprocal Hybrid Striped Bass from Alabama's Public Fishing Lakes

Age	Number of Fish	Back-Calculated Length (mm) at Annulus		
		1	2	3
3	16	267	408	497
2	29	233	358	
1	21	242		

age I hybrids at Lake Hartwell (Williams 1970). Growth was slower than that reported for age I hybrids from West Point Reservoir, Alabama, (Ott and Malvestuto 1982). When compared to hybrids from Lake Bastrop (Fig. I), a 367 ha reservoir located in south central Texas, growth was slower than the rate reported for I, 2, and 3-year old hybrids (Crandall 1978).

A length-weight relationship was developed for hybrid striped bass from Alabama's public fishing lakes. The relationship is expressed by the equation:

$$\log_{10} \text{ weight} = -4.9549 + 3.033 (\log_{10} \text{ length})$$

There exists a dramatic difference in the length-weight relationship between fish from Alabama's public lakes and West Point Reservoir (Fig. 2). The condition factor (K_n) of hybrid striped bass from the public lakes was low (0.41) for 1-year old fish, and continued to decline to 0.27 for 3-year old fish (Fig. I).

West Point reservoir on the Alabama-Georgia border contains, in most years, an abundant population of threadfin shad, *Dorosoma petenense*, and apparently furnished excellent growth conditions for the hybrid striped bass. Alabama's public lakes have primarily bluegill based forage populations and relatively heavy predator populations. Although all of the project lakes contained threadfin shad, the lakes in northern Alabama experience winter kills. DeKalb County Lake, which produced the majority of the hybrid samples, has a winter kill of threadfin shad each winter. Although this forage fish is restocked each spring, the population does not appear to reach high densities under predation by largemouth bass, hybrid striped bass, catfish, and white crappie, *Pomoxis annularis*.

DeKalb County Lake was the only lake to yield sufficient numbers of hybrid striped bass of succeeding year classes to estimate survival. For hybrid striped bass collected at DeKalb County Lake in 1979, survival from age 1 to age 2 was calculated at 30.86%.

Creel records kept by concessionaires provided harvest data of striped bass and hybrids from these public lakes for the past 4 years (Table 5). Prior to 1977, striped bass and hybrids were not listed separately in these creel

Table 5. Harvest of Striped Bass and Hybrids of Striped Bass from Alabama's Public Fishing Lakes

	Number	Weight (kg)	Average Weight (g)
1977-78	491	349	708
1978-79	461	349	758
1979-80	901	542	599
1980-81	1302	903	690
TOTALS	3155	2143	681

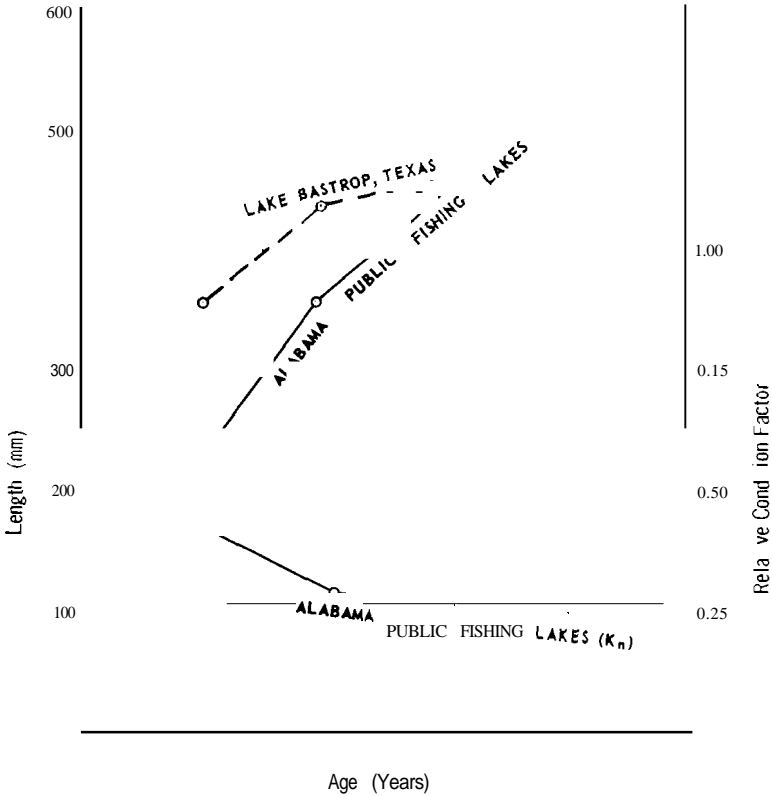


Figure 1. Average back-calculated lengths of hybrid striped bass from Alabama Public Fishing Lakes and Lake Bastrop, Texas (1973 year class), with relative condition factor (K_n) of hybrid striped bass from Alabama's Public Fishing Lakes compared to a normalized condition factor ($K_n = 1.00$) of hybrid striped bass from West Point Reservoir.

records. They were recorded in a column for "other fish." We estimated 485 striped bass and hybrids weighing 329 kg were harvested prior to 1977. Based on these figures we calculated a cost-benefit ratio. Cost of producing and stocking 127,403 fingerlings at 12 cents each and 11,646 advanced fingerlings at \$1.50 each totaled \$32,757.36. Benefit to the fishermen from harvesting 3,640 striped bass and hybrids weighing 2,472 kg was based on assigning a value of \$5.70 per 454 g for striped bass and hybrids (Pfeiffer 1975). The value to fishermen was \$31,030.80, indicating a ratio of benefit-cost = 1.06.

cost	<u>\$32,757.36</u>	
benefit	\$31,030.80	1.06

Crandall (1978) reported that the monetary value of the benefits of stocking hybrid striped bass in Lake Bastrop was approximately 12 times greater than the cost of stocking.

The true benefit to the fishermen at Alabama's public fishing lakes may not be as high as these calculations show. It is doubtful that many fishermen would actually value these fish at \$5.70 per 454 g. Many of the striped bass and hybrids are harvested inadvertently by fishermen seeking other species.

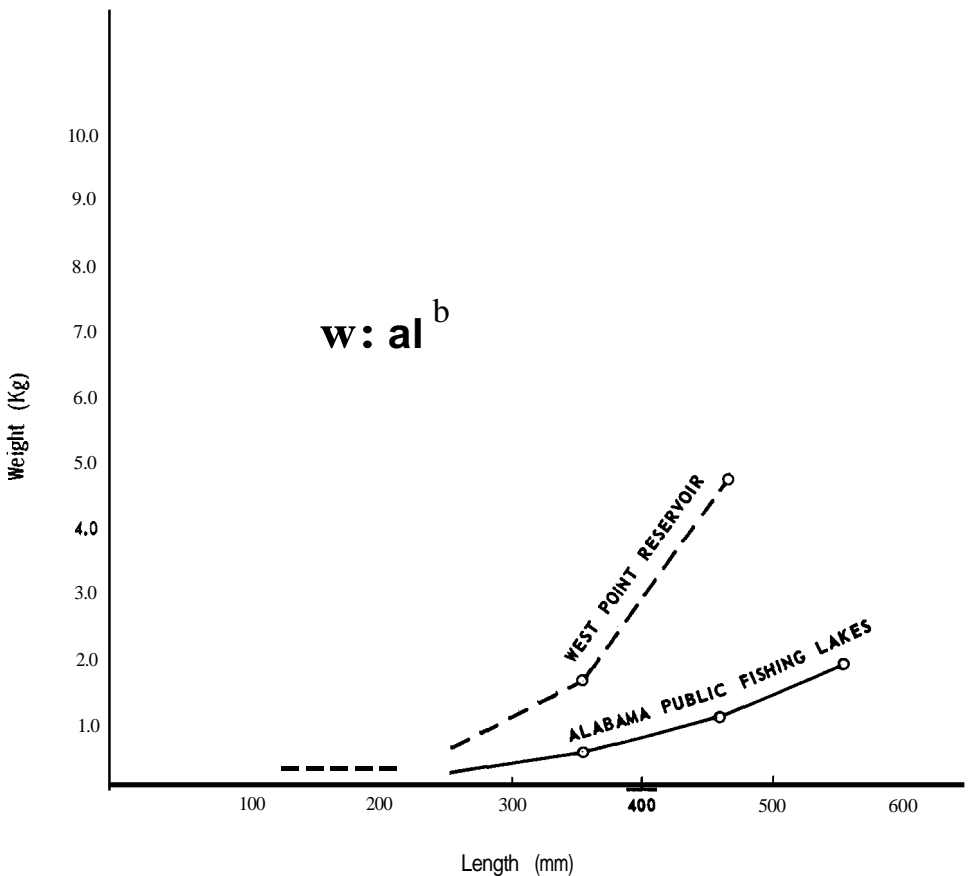


Figure 2. Comparison of the length-weight relationship of hybrid striped bass from Alabama's Public Fishing Lakes with hybrid striped bass from West Point Reservoir.

Biologists interviewed 306 fishermen at 6 different public fishing lakes to gain a variety of information about fishermen who utilize these state-owned lakes. None of the fishermen interviewed were actually angling specifically for striped bass or hybrid striped bass.

The future of hybrid striped bass in Alabama's state lakes appears uncertain. The rate of return in the creel for striped bass and hybrids is at present less than 3% of the stocked fish. Growth, condition, and survival are low to moderate. Large scale interest in harvesting these fish has not developed among the angling public at these lakes. The overall success of striped bass and hybrids in these small intensively managed lakes has been below prestocking expectations.

However, the recent harvest of striped bass and hybrid striped bass at Monroe County Public Lake, which was not included in the sampling for striped bass and hybrids in this study, has been encouraging. From January 29, 1982, through March 14, 1982, fishermen harvested 1,039 striped bass and hybrids weighing 850 kg. During this period, 1,558 fishermen fished at this 38 ha lake. Monroe County Lake received stockings of 1,740 advanced fingerling striped bass and hybrid striped bass from 1974 through 1977. From 1979 through 1981, 7,050 fingerling hybrid striped bass were stocked. The success of stocking striped bass and hybrids is at present unpredictable and sporadic. The majority of the hybrid striped bass collected for this study were from DeKalb County Lake.

Presently, striped bass are no longer stocked due to concern of high summer temperatures causing stress to the fish in these small fertile lakes (Schaich 1979, Waddle 1979, and Moss 1982). Reciprocal hybrid striped bass are no longer produced and stocked, since hybrid striped bass fry can be produced more efficiently. Advanced fingerling hybrid striped bass are no longer stocked because of the high cost of producing these fish. Stockings of hybrid striped bass fingerlings has continued but in only 6 of the 13 state lakes which have previously received hybrids.

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