Effect of Striped Bass Introduction in Lake Wateree, South Carolina[1]

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Abstract: The establishment of a striped bass (*Morone saxatilis*) fishery in Lake Wateree, South Carolina, did not detrimentally influence largemouth bass (*Micropterus salmoides*) growth, abundance, or condition. There was no evidence striped bass introduction altered the clupeid, primarily *Dorosoma spp.*, or the *Lepomis spp.* prey base. An important fishery was added, however, to the reservoir. The authors suggest care in applying results to other less fertile, prey deficient reservoirs.

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This study examines the effects of establishing a striped bass fishery on the largemouth bass, gizzard shad (*Dorosoma cepedianum*), threadfin shad (*Dorosoma petenense*) and *Lepomis spp.* populations in Lake Wateree, South Carolina. Largemouth bass anglers have been concerned that striped bass will displace largemouth bass by competing for available prey, primarily threadfin and gizzard shad. This investigation examined Lake Wateree fisheries from 1977 through 1980 prior to the establishment of a striped bass population and from 1980 through 1986 after establishment. Previous studies indicate striped bass feed extensively on shad (Stevens 1957, Combs 1978) but rarely compete with largemouth bass (Hanson and Dillard 1975) or deplete the prey base (Stevens 1969, Bailey 1974, Combes 1980).

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Methods

Lake Wateree, located in north central South Carolina, is a 5,548-ha mainstream reservoir constructed by Duke Power Company in 1919. This reservoir is the seventh and most southern reservoir on the Catawba River system. Earlier studies indicate this is the most fertile impoundment on the Catawba River system (Weiss 1975) with standing stocks of 500 to 1,000 kg/ha and 38 fish species represented (Nash et al. 1984). By far the most abundant fish species is gizzard shad followed by threadfin shad. Together, these 2 species comprise 60% to 80% of the standing stock. Approximately 400,000 striped bass fingerlings, or 72 per hectare, were stocked yearly from 1980 to 1982, after which fish were stocked at the same rate in alternate years.

Lake Wateree is heavily fished with a total estimate of 268 angler hours/ha recorded for a 16-month period in 1984–1985 (Nash et al. 1985). The average catch per unit effort for largemouth bass and striped bass was 0.35 and 0.40, respectively.

The abundance of striped bass was monitored yearly during November through January with 24-hour sets of experimental gill nets. The catch of striped bass was reported as catch per 1,000 m^2 of net.

Stomach contents were examined from 1,260 largemouth bass collected by electrofishing between 1978 and 1984 and in 957 striped bass captured in gill nets during 1980 to 1984. Fish were measured for total length to the nearest millimeter and stomachs were preserved in a 10% formalin solution. Estimated percentage volume of each food item was determined. Food items were then grouped into the estimated percent invertebrate and fish composition.

A comparison of largemouth bass growth using scales was made before and after introduction of striped bass. Back-calculation of length at annulus formation was computed for individual fish using a Dahl Lea Proportion Method (Dahl 1909, Ricker 1975).

Cove rotenone samples (Chance 1958, Swingle 1958) were performed yearly in August from 1977 through 1985 on the same 4 coves. These coves, totaling 2.4 ha, were sealed by a blockoff net prior to the application of 1 mg/l emulsified rotenone. First and second day pickups were made. Cove rotenone data provided average standing stock per unit area, species composition, size distribution, and community biomass ratios (Swingle 1950).

Length to weight comparisons (LeCren 1951) for largemouth bass collected before and after establishment of striped bass were made using: Log Weight = log A + nlog Length. All statistical comparisons in this study were made at the 5% level of significance.

Results

Table 1 lists the results of gill netting conducted from 1980 through 1986. The striped bass population became well established in Lake Wateree and their abundance apparently peaked in 1981–1982.

Figure 1 shows the estimated percent food composition in the diet of largemouth bass by major food groups before and after stocking. Of the 1,260 largemouth bass examined, 495 (39%) had empty stomachs. Fish dominated the diet of all size ranges of largemouth bass before and after stocking striped bass. Figure 2 lists the same information for striped bass after their establishment; again, fish were the major food item in the diet of all sizes of striped bass examined.

The addition of striped bass in 1980 had little influence on the growth or length

Table 1. Relative abundance of striped bass captured in standardized experimental gill nets in Lake Wateree, South Carolina, from 1980 to 1986.

Year	Total amount of net set (m^2)	Total catch	Catch/1000 m^2 of net
1980–1981	4,019	91	23
1981–1982	2,679	702	262
1982–1983	5,359	365	68
1983–1984	3,938	358	91
1984–1985	4,016	157	39
1985–1986	4,016	264	66

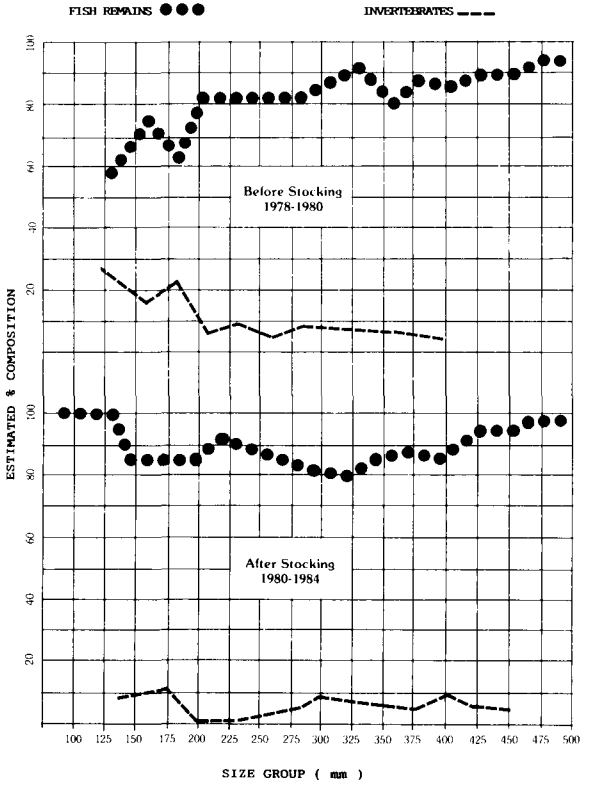

Figure 1. Estimated percent composition of fish and invertebrates in the diet (by size group) of largemouth bass collected in Lake Wateree, South Carolina, before (1978–1980) and after (1980–1984) stocking striped bass.

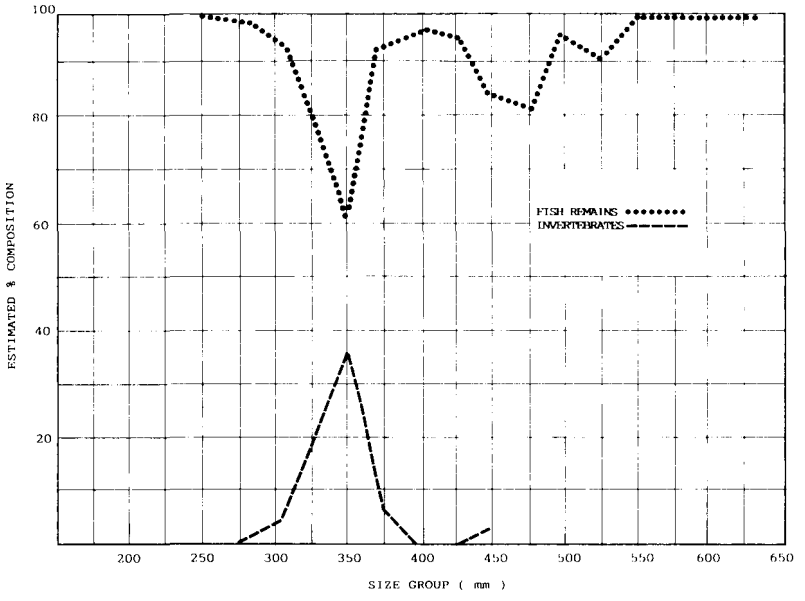

Figure 2. Estimated percent composition of fish and invertebrates in the diet (by size group) of striped bass in Lake Wateree, South Carolina, between 1980 and 1984.

Table 2. Back calculated length at annulus formation for largemouth bass before and after introduction of striped bass in Lake Wateree, South Carolina.

	Length (mm) at annulus formation	
Age class	Prestocking (1978–1980)	Poststocking (1980–1984)
I	177	177
II	264	263
III	312	322
IV	363	379
V	405	409
VI	437	437
	N = 767	N = 1,479

to weight relationship of largemouth bass. The length-weight relationship of largemouth bass did not change after striped bass were introduced. Table 2 presents the average lengths at annulus formation for largemouth bass before (1978–1980) and after establishment of striped bass; there was no significant change in largemouth bass length at annulus formation.

Little change in species contribution to the total standing stock, E value, (Swingle 1950) was evident after stocking striped bass (Table 3). Further standing stocks of prey species remained relatively constant during this period.

Table 3. Average standing stock in kg/ha and percentage (in parenthesis) of standing stock for largemouth bass, lepomid sunfish, threadfin, shad, and gizzard shad in 4 cove rotenone samples totaling 2.4 ha in Lake Wateree, South Carolina, from 1977 to 1985.

Species	Year								
	1977	1978	1979	1980[a]	1981	1982	1983	1984	1985
Gizzard shad	621 (86)	230 (62)	207 (43)	673 (64)	329 (45)	302 (48)	262 (49)	861 (77)	273 (46)
Threadfin shad	5 (1)	0	90 (18)	268 (25)	98 (13)	98 (16)	148 (28)	30 (3)	117 (20)
Lepomis spp.	43 (6)	51 (14)	53 (11)	42 (4)	88 (12)	69 (11)	43 (8)	78 (7)	133 (16)
Largemouth bass	8 (1)	13 (4)	10 (2)	10 (1)	44 (6)	21 (3)	16 (3)	24 (2)	16 (3)
Mean standing stock	721	367	486	1,058	737	623	535	1,117	601

[a]Striped bass were established in 1980.

Discussion

Extensive data examined in this study indicate no serious competition for available prey between striped bass and largemouth bass or any depletion in the prey base. Therefore, angler concerns about establishing striped bass in Lake Wateree appear unfounded. An abundance of prey remains available for both largemouth and striped bass as demonstrated by (1) analysis of stomach contents and (2) the high standing stocks of prey species found in annual cove rotenones. Additionally, E values, the species contribution to the total standing stock, of prey species remained relatively constant after establishing striped bass. No significant differences in the length to weight relationship of largemouth bass, little or no change in length at annulus formation, and stable E values for largemouth bass further suggest a lack of competition between largemouth and striped bass.

Striped bass introductions have, in several instances, depleted the prey base or negatively impacted native species in reservoirs (Stevens 1969, Morris and Follis 1978). However, as Bailey (1974) pointed out, striped bass introductions have not depleted the prey base in most southeastern reservoirs. In the 2 reported instances where striped bass were thought to have impacted the prey base, the standing stock of prey species were in the range of 100 to 200 kg/ha (Stevens 1969, Morris and Follis 1978).

This 9-year study suggests that striped bass, instead of being a detriment, had no noticeable influences on the largemouth bass fishery or on the prey base. Care should be used in applying these results and those mentioned by Bailey (1974) to other systems. The addition of striped bass did not impact this system with standing stocks of prey that often approach 900 kg/ha but might have a detrimental effect in less fertile systems where standing stocks of clupeids were less than 100 kg/ha.

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