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Food habits and growth of young-of-year striped bass in Cherokee Reservoir, Tennessee

Bruce Michael Saul

To the Graduate Council:

I am submitting herewith a thesis written by Bruce Michael Saul entitled "Food habits and growth of young-of-year striped bass in Cherokee Reservoir, Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Wildlife and Fisheries Science.

J. Larry Wilson, Major Professor

We have read this thesis and recommend its acceptance:

David A. Etnier, Thomas K. Hill, Richard J. Strange

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Douglas C. Peterson

Accepted for the Council:

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Graduate Studies and Research

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FOOD HABITS AND GROWTH OF YOUNG-OF-YEAR STRIPED BASS IN CHEROKEE RESERVOIR, TENNESSEE

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Bruce Michael Saul

August 1981

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ABSTRACT

Of 109,675 striped bass young-of-year stocked at Quarryville in June 1979, only 70 were recaptured; none of the 80,480 stocked in June 1980 were recovered. Of a similar number of hybrids (80,000) stocked in June 1980, 206 were collected for food habits and growth analyses. Chironomidae and Crustacea were the primary food items of striped and hybrid bass introduced into the reservoir. Striped bass switched from invertebrates to fish (primarily Clupeidae) at 20 cm or approximately one year after stocking. Hybrids over 5.1 cm consumed small fish shortly after they were stocked and continued as they grew larger. Food habits of white bass were also examined and compared to striped and hybrid bass. All three species were often observed feeding at the interface between the substrate and the water column. Preferred substrates ranged from a sand-clay mixture to a muddy-soft mixture.

Striped bass stocked at an average length of 3.5 cm grew approximately 21.7 cm in one year. Hybrids attained a similar length, 21.5 cm, after only 7 months' growth. Condition factors (K) were similar for both striped and hybrid bass (0.8 to 1.3) during their first year of growth.

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CHAPTER I

INTRODUCTION

As a result of the persistence and dedication of many researchers in the past decade, a very popular game fishery has been developed in inland waters with populations of striped bass (*Morone saxatilis* Walbaum). These freshwater populations have not only aided in controlling clupeid numbers, but have also supplied many hours of fishing enjoyment.

Since the late 1950's, striped bass introductions into inland waters have become an integral part of many state fishery programs. Successful hatchery procedures have permitted some states to utilize local sources of brood fish to support a yearly stocking program. Tennessee has maintained such a program since the late 1960's by stocking fry and juveniles into reservoirs in middle and eastern sections of the state. These include Barkley, Boone, Cherokee, Chickamauga, Kentucky, Melton Hill, Norris, J. Percy Priest, Tims Ford, and Watts Bar reservoirs (Cottrell, personal communication).

Since the initial stocking of striped bass in Tennessee, limited research has been conducted to determine various aspects of the life history of young-of-year and yearlings. A study by Higginbotham (1979) on Watts Bar Reservoir has been the most comprehensive research effort in Tennessee waters.

The primary purposes of this investigation were to obtain information to help fishery managers determine the size striped bass best suited for successful stocking and to identify the sites in Cherokee Reservoir most favorable for their growth. Specific objectives included (1) analyses of food habits of young-of-year and yearling striped bass, (2) comparisons of possible food habits competition between striped bass and other reservoir species, (3) determination of young-of-year striped bass movements and preferred areas at different times of the year, and (4) collection of other life history and habitat information useful for survival and growth of young-of-year striped bass.

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CHAPTER II

LITERATURE REVIEW

Many studies of striped bass have been published since Worth's paper in 1881. Most of the studies dealt with propagation, growth, food habits, movements, and physiology of marine and anadromous fishes.

Introduced inland populations of striped bass have become more and more the topic of studies in many states, especially in the Southeast. Scruggs (1955), Surber (1957), and Stevens (1957) reported on the original landlocked freshwater striped bass population in Santee-Cooper Reservoir, South Carolina, and some aspects of its life history. Bailey (1974) discussed the implications and results of striped bass introductions into inland reservoirs in southeastern states. Several studies have been published dealing with food habits of adult striped bass in the Southeast. These studies, including Stevens (1957), Weaver (1975), Combs (1978), and Morris and Follis (1978), revealed a strong preference for shad. Movements of adult striped bass using telemetric methods were investigated by Waddle et al. (1980), Schaich and Coutant (1980), and Stooksbury (1977).

A few studies have been devoted to young-of-year striped bass stocked into inland reservoirs. Gomez (1970) studied young-of-year striped bass in Canton Reservoir, Oklahoma, and found that striped bass under 100 mm preferred dipteran larvae, whereas fish over 100 mm preferred fish as the main diet component. Mensinger (1970) described the growth and abundance of young-of-year striped bass in Keystone Reservoir, Oklahoma. Ware (1970) studied growth and food preferences of Florida's inland striped bass and found that fish under 15 cm preferred mosquito fish, mollies, and freshwater shrimp. Erickson et al. (1971) studied the age and growth of striped bass in Keystone Reservoir, Oklahoma, and presented length-weight relationships of young-of-year and adult fish. The most complete study of young-of-year striped bass in inland waters was by Higginbotham (1979). He described fish as the preferred food in all sizes of striped bass with the exception of 105 to 125 mm fish. They preferred crustaceans. He also discussed movements after stocking and substrate types over which fish were most often found.

Culture pond studies of young-of-year striped bass food habits have related basic preferences of available food items. A study by Sandoz and Johnston (1965) revealed preferences for cladocerans and commercially prepared feeds for young-of-year striped bass in Oklahoma culture ponds. Harper and Jarman (1971) also studied striped bass in Oklahoma culture ponds. They found copepods were the preferred food of striped bass from 10 to 50 mm, cladocerans for fish from 20 to 110 mm, and insects as the primary food item of young-of-year fish above 80 mm. Humphries and Cumming (1971) reported that Virginia hatchery pond fish preferred cladocerans, copepods, and insects. Humphries and Cumming (1973) later described striped bass under 10 mm as preferring early instars of copepods and cladocerans. Fish from 10 to 30 mm preferred adult copepods, 30 to 80 mm fish selected cladocerans, and 80 to 100 mm fish chose insects as their major food item.

CHAPTER III

DESCRIPTION OF STUDY AREA

Cherokee Reservoir is located on the main stem of the Holston River in East Tennessee. This multipurpose storage impoundment was built in 1941 by the Tennessee Valley Authority (TVA). At full pool, it extends from Cherokee Dam at Holston River Mile (HRM) 52.3 to the John Sevier Steam Plant detention dam at HRM 106.3. TVA operates this reservoir primarily for hydroelectric power generation and flood control.

At full pool, this reservoir covers 12,220 hectares (30,200 acres) with a maximum depth of 46 m. At 328 m above mean sea level, Cherokee fluctuates between a normal summer pool of 321 to 327 m and a normal minimum pool of 311 to 318 m in the winter (Waddle et al. 1980). During normal years, the average annual flow through the dam is 127 cms. Cherokee Lake can extend from 48 to 87 km upstream from the dam, depending on pool stage elevation.

Watershed cover is approximately 50% forest, 26% pasture, 12% cropland, and 12% other uses (Waddle et al. 1980). The major inflow is the Holston River which drains a large amount of Northeast Tennessee and Southwest Virginia. Many small creeks enter the reservoir from surrounding ridges. Direct drainage area above the dam covers 8879 km^2. This area is underlaid with layers of shale, sandstone, and limestone which comprises the largest portion.

The Holston River Basin serves several industrial and municipal areas as a major discharge region. Synthetic fiber plants and chemical manufacturing plants are the major sources of industrial pollutants. In addition to these nutrient-rich discharges, domestic wastes comprise a part of the total discharge into Cherokee Reservoir. Due to the nutrient load carried by the Holston River, Cherokee Reservoir is considered eutrophic with a very heavy plankton growth.

Physical characteristics of the reservoir vary from shallow riverine areas with exposed shoals in the upper reservoir to deep, large coves and numerous islands in the lower reservoir. Small tributaries and ground water springs are relatively scarce in the lower reservoir.

Seasonal variations occur in dissolved oxygen and thermal conditions especially from March through October (Waddle et al. 1980). During winter months, the reservoir is isothermal and dissolved oxygen levels are high in all parts of the reservoir. Beginning in March or April, thermal stratification develops and persists in a layer from 6 to 9 m deep until September or October. Depletion of dissolved oxygen becomes a problem especially in deeper waters during the peak of summer heat when the surface stratum becomes quite warm (above 27 C). By the end of October, the reservoir shows only slight stratification and oxygen levels return to near saturated levels.

CHAPTER IV

MATERIALS AND METHODS

Collection Period from June 1979 Through May 1980

Historically, striped bass have been introduced into the upper reaches of Cherokee Reservoir (Figure 1) because of the rich zooplankton concentrations and relatively low numbers of predators. In recent years, Quarryville access area ramp at HRM 91.5 has been used as the major stocking site. Thus, on 23 June 1979, collections were initiated there to determine prestock populations of fish, zooplankton, and benthic invertebrates. Each of eight prestock locations in the vicinity of Quarryville access area were sampled with the following methods: (1) two quarter hauls with a 3.2 mm x 1.2 m x 6.1 m straight seine to determine fish present, (2) two 5 m plankton tows with a 22.9 cm diameter plankton net (60 mesh) to determine zooplankton concentrations, and (3) two Ekman dredge samples (3540 cm^3 each) to determine benthic invertebrates present. Prestock sites were chosen up to 8 km in either direction from Quarryville access. All samples, prestock and poststock, were collected after sundown.

From 26-28 June 1979, a total of 109,675 fingerling striped bass, ranging from 3.8 to 5.1 cm, were stocked at the Quarryville access ramp. Poststock collections of fish began on 10 July 1979 and were made twice each month through October. Collections continued on a monthly basis from November through the following June 1980 and subsequent stocking of the next year's fingerlings.

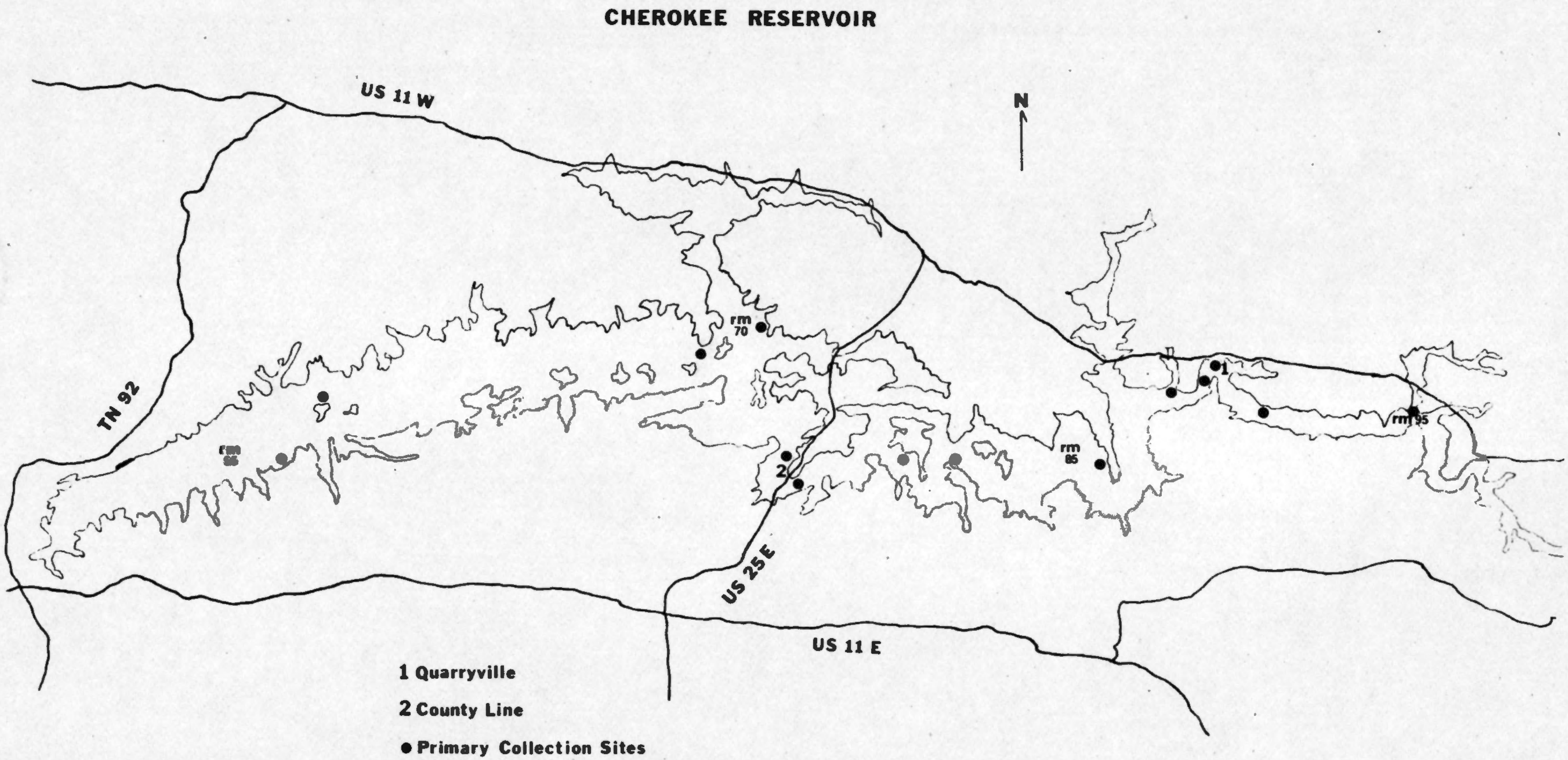

Figure 1. Location of stocking sites for striped bass and hybrids in Cherokee Lake, Tennessee.

During biweekly collections, zooplankton were sampled at each location. Substrate was sampled at high water (April through June), normal pool (June through October), and winter pool (October through March). Fish were collected with a 9.5 mm x 1.8 m x 15.2 m straight seine on each collection date at five to eight sites per night.

During monthly fish collections, zooplankton were sampled and substrate was sampled at winter pool levels. Fish were collected using gill nets and electrofishing. From 3 to 12 gill nets were set in various combinations at these monthly intervals. The four different sizes of gill nets were 45.7 m long by 1.8 m deep with mesh sizes of 12.7, 19.1, 25.4, and 31.8 mm. The usual set consisted of a combination of mesh sizes tied end to end. During the winter months, gill nets were set at dusk and retrieved at dawn. Electrofishing utilizing a boom-type 230-volt (500 watt) high cycle generating unit was done during night-time sampling intervals on several of the collection dates.

Seining sites consistently sampled were Caney Creek access ramp, Quarryville access ramp, a covered road bed at HRM 89.9, Fall Creek access ramp, County Line access ramp, and Oak Grove access ramp. Gill netting and electrofishing sites consistently sampled were selected sites near Quarryville, Fall Creek, County Line, Oak Grove, Twin Islands, and Black Oak access areas.

Collection Period from June 1980 Through January 1981

During the 1980 stocking season, the Tennessee Wildlife Resources Agency Striped Bass Committee divided the stock equally between striped bass and white bass (male) x striped bass (female) hybrids (hereafter referred to as hybrids). On 19 June 1980, collections were initiated to determine prestock populations of fish, zooplankton, and benthic invertebrates. Each of five prestock locations was sampled in a manner similar to the previous year's method. Sites were chosen up to 8 km in either direction from Quarryville access, the striped bass stocking site. In addition to the covered road bed at HRM 89.9, sites sampled were Caney Creek, Quarryville, County Line, and Fall Creek access ramps. As a result of prestock analysis of food availability, 80,000 hybrids were stocked at County Line access ramp at HRM 75 on 23 June 1980, and 80,480 striped bass were stocked at Quarryville access ramp on 1 July 1980.

Poststock collections began on 15 July 1980 and areas were sampled up to 8 km on either side of both stocking sites. Fish were collected every two weeks with straight seines and gill nets as in the previous year. Zooplankton were sampled on every collection interval at each site; substrate was sampled at summer pool levels.

From July through August 1980, seining and gill netting were utilized on each collection date. From August through September 1980, the lake was divided into two sections: (1) Quarryville, 8 km in either direction and (2) County Line, 8 km in either direction. During each month, each of these areas was seined and gill netted at least once. During October 1980, seining, gill netting, and electrofishing were used to sample the County Line area. During November 1980, gill netting and electrofishing were used to sample the Quarryville area. In December 1980 and January 1981, the County Line area and an additional 8 km downstream were sampled by electrofishing and gill netting. During these periods, reference collections of zooplankton and substrate were made.

During the entire collection period (June 1979 through January 1981), sampling was continued at each collection date until no striped bass and/or hybrids were collected. This required a collection one site beyond the last site at which either of the two species was captured. All specimens were preserved in 10% formalin for later analysis in the lab.

Food Habit Analysis

Gut analyses were performed on all striped bass and hybrids collected during the sample period (the gut included the entire digestive tract from the esophagus to the anus). White bass and black bass gut analyses were restricted to the total number (up to 30 individuals each) of fish caught per site and date at which striped bass or hybrids were also caught. Gut contents from white bass and black bass collected at sites where striped bass or hybrids were not found were also analyzed at the rate of 10 per water level period. Other fish, such as catfish, crappie, drum, shad, minnows, and bluegill were also divided into groups associated with the presence or absence of striped bass or hybrids at the rate of five per water level period.

Food item analyses were performed after total length in cm and total weight in gm were obtained for each fish. Total gut analysis was determined to be the most effective way to determine all foods eaten by each species.

In all fish, a shallow incision was made between the pelvic fins. Blunt-ended scissors were inserted into this shallow opening and an incision was made from the anus to the isthmus. A lateral incision was made from the isthmus to the opercle and from the anus to the lateral line. This enabled a flap to be opened to expose the total gut. After removal, contents of the gut were scraped into a petri dish and categorized under a 40X binocular dissecting scope. Food items were counted and classified into family or the lowest taxa when practical.

Substrate samples were poured through a series of sieves to segregate invertebrates captured. The sieves were standard brass substrate sieves categorized by mesh size (number of holes per square inch). Sizes 10, 20, and 40 were the ones utilized in this study.

Zooplankton samples were diluted to 50 ml and stirred vigorously. Before the suspension settled, 1.0 to 5.0 ml samples were withdrawn with Hensen-Stempel pipets. Each sample was analyzed until a total of 200 organisms was counted. From the ratio of percent volume counted to the total percent volume sampled, the total organisms per sample could be determined.

Data Analysis

Analyses of most food habit and growth data were performed through the use of UTCC Decsystem-10 and SAS 1979. Preferred foods, mean preferred foods, and frequency of occurrence of foods were calculated for each species of fish and by site availability of the consumed foods. Coefficients of Condition (Hile 1936)

$$K = \frac{100 \times \text{weight in grams}}{\text{total length}^3 \text{ in centimeters}}$$

were determined for striped, hybrid, and white bass. Weight-length relationships (Ricker 1975) were calculated for these three species using the formula Log W = log a + b log L where W = weight in grams, L = total length in cm, a = intercept, and b = slope. Electivity indices (Ivlev 1961) were calculated to determine preferred foods. This quantitative index was calculated using the equation,

$E = \frac{r_1 - p_1}{r_1 + p_1}$, where E = electivity, r_1 = occurrence of an item in the fish diet expressed as a percentage of total number, and p_1 = the relative quantity of the same item in the lake expressed as a percentage. The limiting values of E are positive values (+) indicating selection for an item, negative values (-) indicating selection against an item, and zero (0) indicating no selection or that items were eaten in proportion to their occurrence in the lake.

CHAPTER V

RESULTS AND DISCUSSION

Lake Conditions June 1979 Through January 1981

At the onset of this study in June 1979, Cherokee headwater elevation was 326.4 m, 5.8 m above normal. Due to these high water levels, many shallow areas existed which increased the amount of substrate available for possible food organisms to inhabit. Some of these areas were parking lots around access areas and shallow mud flats. Vast areas of vegetation were also inundated, allowing excellent opportunity for increased survival of many species of game fish.

In contrast, water levels of June 1980 were slightly lower than the normal pool elevation of 321 m. Reservoir conditions allowed more area of substrate to be above the water level of the past summer. There were also steeper banks, less area available for food organisms, and less submerged vegetation for nursery habitat of many game fishes.

Prestock Analysis

In June 1979, eight potential stocking locations were sampled. Four sites, Caney Creek, Quarryville, Fall Creek, and County Line access areas were found to have low numbers of predators, high numbers of food organisms, and easy accessibility for the hatchery truck (Table 1). Predator counts at potential stocking sites were considered although no documentation was found to substantiate their effects on stocked striped bass and hybrids. Quarryville access had the highest number of

Table 1. Prestock Analyses of Predators,[a] Plankton,[b] and Benthos[c] for Possible Stocking Sites.

Prestock Sites	Predators Per m^3	Plankton Per m^3	Benthos Per m^3	Total Food Organisms Per m^3
June 1979				
Caney Creek	<0.1	59.3	13571.4	13630.8
Quarryville	<0.1	39.7	23428.6	23468.3
Fall Creek	0.1	62.7	2000.0	2085.9
County Line	0.1	89.3	2714.0	2836.7
June 1980				
Caney Creek	<0.1	12.3	5428.6	5440.9
Quarryville	<0.1	59.8	7857.1	7917.0
Fall Creek	0.1	48.2	3285.7	3333.9
County Line	0.4	12.9	6857.1	6874.8

[a]Number of predators collected per m^3 in two quarter hauls with a 3.2 mm x 1.2 m x 6.1 m straight seine including white bass, black bass, crappie, and channel catfish.

[b]Number of plankton (zooplankton) organisms collected per m^3 in two 5 m hauls with a 22.9 cm diameter plankton net (60 mesh).

[c]Number of substrate organisms collected per m^3 in two Ekman grabs, 3540 cm^3 each. To convert benthos per m^3 to m^2 divide by 14.

food organisms per m^3 and a very low predator count and was chosen as the stocking site. This area had been used in the past as the stocking site for Cherokee Reservoir.

In June 1980, six potential stocking locations were sampled to determine two favorable sites, one for striped bass and one for hybrids. The same four sites previously chosen in 1979 were again found to be the best stocking areas. Quarryville and County Line access areas were chosen because of the high numbers of food organisms and the relatively low numbers of predators (Table 1). County Line had somewhat larger predator ratios, but it was found to be due to a large number of channel catfish fry and fingerlings (not considered predators). It was thought that these high numbers of catfish would not affect the stocking of hybrids as much as striped bass, so this location was chosen as the hybrid stocking site. Striped bass were stocked at Quarryville as in 1979. The total numbers of food organisms per m^3 were two and three times higher in 1979 as in 1980 in the upper reaches of the reservoir (Caney Creek and Quarryville). This was probably due to the larger area available to substrate organisms in 1979 than in 1980. There was less difference in numbers of organisms between years at Fall Creek and County Line accesses which were located farther downstream in the reservoir. Upon examination of forage fish available for young-of-year striped bass, it was determined that almost all fish collected were too large to be consumed.

Individual food organisms, including zooplankton and substrate organisms, are shown as a percentage of the total food found per month in Table 2. Dipterans (primarily midges) and crustaceans, primary

Table 2. Food Organisms by Percent (Including Zooplankton and Substrate Organisms) Present at Sampling Stations During Each Monthly Interval.

Date	Chironomidae larvae	Chironomidae pupae	*Chaoborus* larvae	Ostracoda	Cladocera	Copepoda	Hydracarina	Hymenoptera pupae	Larval fish	Miscellaneous[a]
6-79	39.1	11.8	0.9	6.5	34.8	2.3	0.3		4.0	0.3
7-79	43.9	2.9		0.8	38.3	13.2	0.5	0.1	0.1	0.2
8-79	48.3	2.1	0.1	1.1	31.7	15.8	0.7	0.1		0.1
9-79	10.4	0.3	10.7	0.2	48.2	30.2				
10-79	40.8	3.4	0.9		28.7	25.6				0.6
11-79					34.1	65.9				
12-79	50.0				2.1	47.9				
1-80					88.2	11.8				
2-80	50.0				4.7	45.3				
3-80					63.6	37.4				
4-80	50.0				5.3	44.7				
5-80	4.1				33.2	62.7				
6-80	53.5	2.2	0.2	0.1	36.5	7.4			0.1	
7-80	20.8		1.3		68.9	8.8	0.1		0.1	
8-80	31.2	6.2	11.4	0.1	44.9	6.1			0.1	
9-80	50.9		13.1	0.2	19.6	16.2				
10-80	50.0			0.2	47.9	1.9				
11-80	100.0									
12-80	50.0				42.9	7.1				
1-81					61.7	38.3				

[a]Includes inorganic and organic detritus, insect parts, or any other unidentifiable material.

food sources, appeared to fluctuate in a cyclic pattern in all seasons except summer. This pattern is more evident in Figure 2. During the 1979-1980 season, Crustacea comprised virtually the entire sample in every other month, with the exception of summer. In months where other organisms were collected, Diptera were approximately equal in number to Crustacea. The summer percentages probably reflect an even level of population numbers. The cyclic pattern could be due to the fact that all monthly collections, with the exception of summer, reflect fewer numbers of samples at fewer sites. The summer collections reflect large numbers of samples at many sites.

Food Habits

Food habits of fish were analyzed from July 1979 through January 1981. Striped bass were collected from July 1979 through August 1980 and hybrids were collected from July 1980 through January 1981. Food habits of striped bass were based on gut analyses of 72 specimens. With the exception of six 1979 and two 1978 fish, all striped bass were young-of-year. All striped bass contained food items in the gut. Young-of-year hybrid food habits were based on 206 gut analyses. Of this number, nine (4.4%) were empty. White bass food habits were based on 707 gut analyses, the majority being young-of-year with some 1^+ and 2^+ fish. Older fish were included when captured along with the striped or hybrid bass. Of the total white bass, 47 (6.6%) were empty. Young-of-year black bass food habits were based on gut contents of 98 largemouth, spotted, and smallmouth bass; three (3.1%) were empty. Food items found in fish may reflect availability of organisms rather than active selection by the fish.

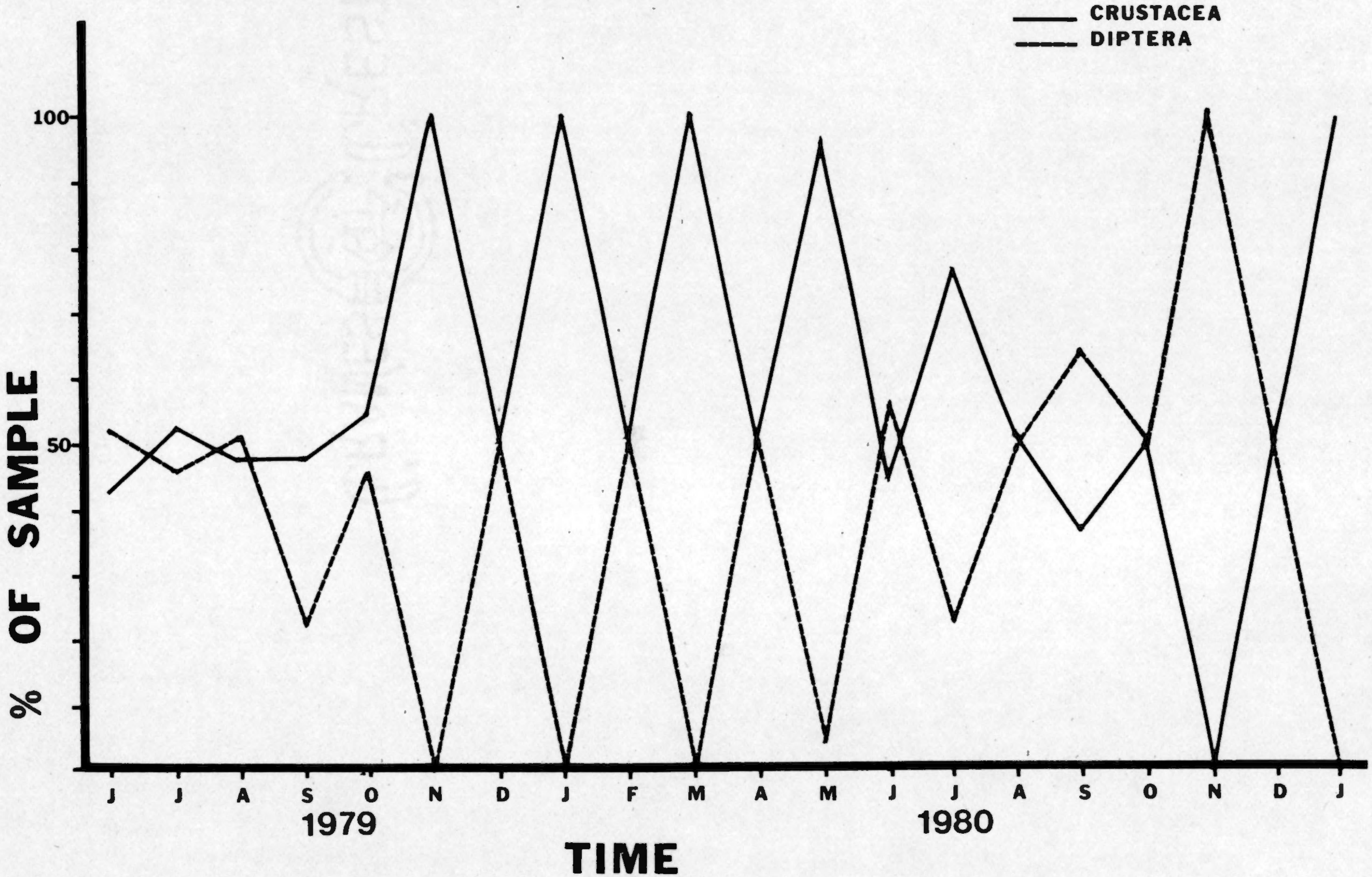

Figure 2. Crustacea and Diptera (by percent of total) present at sampling stations during each monthly interval.

The total percentages of food items ingested by striped bass, hybrids, white bass, and black bass during the entire study period are presented in Table 3. Young-of-year striped bass consumed more Chironomidae larvae and pupae than all other food organisms in terms of percentages of total numbers consumed. Chironomidae comprised over 52% of all items consumed during the study period whereas fish made up only 4% of the total diet. Young-of-year hybrids consumed more Chironomidae than all other food organisms but to a lesser degree than striped bass. Chironomidae were consumed by hybrids at approximately 34% and fish at 14%. Due to the size differences of food items such as fish and Chironomidae, fish probably made up the largest weight of food consumed by hybrids. White bass food consumption percentages were between those of striped and hybrid bass with Chironomidae at approximately 43% and fish at 12%. Black bass ingested Chironomidae more than striped bass. Midges constituted 58% of all foods consumed, while fish made up only 8% of the total diet. These percentages approximated those of striped bass rather than those of white or hybrid bass. This could reflect higher competition levels between these species. The higher values of Chironomidae consumption could reflect a more shore-oriented feeding pattern. White and black bass collected at sites other than those where striped bass and hybrids were captured reflected similar food consumption for the same species at striped bass and hybrid collection sites (Appendix A). Other species of fish, both at sites where striped and hybrid bass were collected and at other sites where striped and hybrid bass were not collected, consumed primarily aquatic insects (especially Chironomidae) and Crustacea.

Table 3. Total Percentages of Food Items (by Actual Numbers) Ingested by Striped, Hybrid, White, and Black Bass During the Study Period.

Food Organisms	Striped Bass	Hybrid	White Bass	Black Bass
Chironomidae larvae	30.6	16.0	22.5	28.3
Chironomidae pupae	21.8	18.1	20.7	29.5
Chaoborus larvae	3.9	7.7	8.3	0.4
Amphipoda			0.6	
Ostracoda	1.5	3.7	1.1	2.5
Cladocera	7.8	1.6	4.3	0.4
Argulus	1.5	3.7	2.3	0.8
Copepoda	4.9	8.8	5.7	0.8
Clupeidae	3.4	10.3	6.7	2.1
Centrarchidae		0.4	0.3	0.4
Notropis		0.1		2.9
Morone chrysops	0.5		0.6	
Ictalurus punctatus			0.1	
Larval fish		0.7	1.5	
Unidentified fish		2.8	3.1	2.9
Ephemeroptera	0.5	3.5	0.8	1.2
Hydracarina	2.4		0.1	0.4
Hymenoptera pupae	3.4	1.6	1.5	12.3
Neuroptera larvae	1.0		1.1	0.4
Miscellaneous	15.8	19.4	15.2	13.5
Empty	0.0	1.6	3.5	1.2

Other fish species included channel catfish, minnows, shiners, drum, crappie, carpsuckers, carp, shad, logperch, and sunfish.

Due to the high numbers of Chironomidae available per m^3 of substrate, competition for these organisms between fish was considered minimal. Competition would more likely come into play when a species shifted to fish, a more limited food source. Judging from Table 3, striped bass food habits were more like black bass, while white bass food consumption was similar to hybrids. This does not altogether rule out the competition between striped and white bass as they were often found schooling together. Striped and hybrid bass were never collected at the same site in this study.

If food habits are analyzed in terms of percent frequency of occurrence, food items can be analyzed as to the degree of utilization by a particular predator species. Chironomidae appeared most frequently in striped bass gut samples. Almost 71% of all striped bass guts analyzed contained this food organism. Crustacea appeared in 14% of the guts while fish appeared in only 8%. The frequency at which a particular food item occurred in striped bass guts is shown in Table 4. Hybrids showed a more balanced occurrence of food items in their diets with 33% containing Chironomidae, 15% containing Crustacea, and 16% containing fish. Although striped and hybrid bass both consumed Chironomidae in larger percentages than other food items by frequency of occurrence, hybrids tended to ingest Crustacea and fish in greater percentages than in striped bass. White bass gut contents were intermediate in percentages between those of striped bass and hybrids. Chironomidae appeared in 48% of the guts sampled, Crustacea in 16%,

Table 4. Frequency of Occurrence (Percent of Total) of Food Items Ingested by Striped, Hybrid, White, and Black Bass.

Food Organisms	Striped Bass	Hybrid	White Bass	Black Bass
Chironomidae larvae	63.7	14.7	33.4	37.6
Chironomidae pupae	6.8	17.8	14.4	32.7
Chaoborus larvae	0.7	6.2	7.5	0.1
Amphipoda			0.2	
Ostracoda	0.2	1.3	0.2	1.4
Cladocera	7.6	0.6	6.0	0.8
Argulus	0.2	3.0	1.0	1.0
Copepoda	6.4	10.2	7.6	1.8
Clupeidae	6.9	13.3	7.9	2.2
Centrarchidae		0.3	0.2	0.3
Notropis		0.1		2.0
Morone chrysops	1.4		0.5	
Ictalurus punctatus			0.1	
Larval fish		0.5	1.4	
Unidentified fish		2.2	1.6	1.9
Ephemeroptera	0.1	4.5	0.5	0.2
Hydracarina	0.4		0.1	0.1
Hymenoptera pupae	0.4	3.5	1.2	9.2
Neuroptera larvae	0.5		0.1	0.1
Miscellaneous	4.6	17.4	9.5	5.5
Empty	0.0	4.4	6.6	3.1

and fish in 12%. Black bass ingested Chironomidae at 70%, Crustacea at 5%, and fish at 8%. Black bass reflected a tendency to stay closer to shore in consuming Notropis, rarely seen as a food item in the other fish.

Stomach contents indicated Chironomidae were utilized by all fish when total numbers and frequency of occurrence of food items were analyzed. However, due to the abundance of midge larvae, competition for this food item was considered negligible. The most likely source of competition would occur when each species switched to a piscivorous diet. Contents of black and white bass guts analyzed from sites where striped bass and hybrids were not captured revealed similar frequencies of occurrence for the same species captured at striped bass and hybrid sites (Appendix B). It was determined that more fish species were consumed at these sites, possibly meaning that more fish were available due to less competition or that this could be an artifact resulting from fewer numbers of guts being analyzed compared with guts collected at striped bass and hybrid sites. Other fish species, both at striped bass and hybrid sites and not at striped bass and hybrid sites, chose similar percentages of aquatic insects and Crustacea, as seen in the percentages of total number consumed.

Food habits by location. If food habits are examined with reference to collection sites at monthly intervals, Chironomidae were frequently ingested by striped bass in terms of actual numbers consumed. With three exceptions, young-of-year fish ingested Chironomidae at all sites for all months (Table 5). Crustacea were consumed at Fall Creek access in September and October 1979, County Line access in October

Table 5. Food Items Consumed (by Actual Numbers) by Striped Bass at Each Collection Site from July 1979 Through August 1980.

Collection Site and Date	Chironomidae larvae	Chironomidae pupae	*Chaoborus* larvae	Ostracoda	Cladocera	*Argulus*	Copepoda	Clupeidae	*Morone chrysops*	Ephemeroptera	Hydracarina	Hymenoptera pupae	Neuroptera larvae	Miscellaneous
Quarryville Access														
7-79	69.7	9.4			4.8	0.4	11.5					0.3		3.9
8-79	77.3	7.3			6.2	1.0					0.2	0.9		7.1
9-79	38.1	47.6	14.3											
10-79	79.5	20.5												
Holston River Mile 89.9														
7-79	81.4	7.9									4.2			6.5
8-79	85.0												12.5	2.5
Fall Creek Access														
7-79	36.9	15.6	3.9		36.4						4.5			2.7
8-79	87.5	5.8			1.6		0.5						0.4	2.7
9-79	19.6	4.3			72.8						1.1		1.1	1.1
10-79	1.0		2.4				96.1							0.5
11-79[a]								100.0						
12-79[a]								100.0						
Oak Grove Access														
2-80	100.0													
3-80	66.7	16.6						16.7						
County Line Access														
8-79	95.2	4.8												
10-79	0.9		4.1	2.5	7.5		84.0							1.0
6-80	0.2				13.2		20.0	33.3	33.3					
8-80								66.7						33.3
Twin Islands														
4-80	33.5	3.9	3.1		53.6	0.1	5.4			0.1	0.1			0.1
Holston River Mile 56														
5-80								58.3						41.7

[a]Refers to fish stocked in 1978.

1979, and Twin Islands in April 1980. All 1^+ striped bass ingested fish (Clupeidae) at all locations where they were collected. Examination of the entire interval reveals a change in food item consumption. Chironomidae were ingested for 2 to 3 months following stocking (July to September 1979); both Chironomidae and Crustacea were eaten from September 1979 through April 1980. The larger fish consumed Clupeidae; this fact was first established in March 1980 following the previous summer's introduction. These food item selections coincide with food availability (Table 2, page 17) and growth of young-of-year striped bass.

White bass collected at these same sites revealed similar food habits (Table 6). Although Chironomidae were ingested most often, white bass consumed fish at sites where striped bass were collected. This could mean that either the striped bass were not utilizing small fish available at these sites or that white bass were out-competing the striped bass for the few fish that were available. It could also reflect that due to mouth size, the striped bass could not consume the same size fish that the white bass could early in the first growing season. This was probably due to the overall larger size of white bass during any given time period. White bass also were less selective in their diet, as evidenced by the consumption of more varied types of food items than striped bass. These data could mean that white bass out-compete striped bass for these items or, most probably, that they were more opportunistic than striped bass.

Hybrids had different food habits than striped bass as they ate more varied food items (Table 7). In July and August 1980, they not

Table 6. Food Items Consumed (by Actual Numbers) by White Bass at Each Collection Site from July 1979 Through January 1981.

Collection Site and Date	Chironomidae larvae	Chironomidae pupae	*Chaoborus* larvae	Amphipoda	Ostracoda	Cladocera	*Argulus*	Copepoda	Clupeidae	Centrarchidae	*Notropis*	*Morone chrysops*	*Ictalurus punctatus*	Larval fish	Unidentified fish	Ephemeroptera	Hydracarina	Neuroptera larvae	Hymenoptera pupae	Miscellaneous	Empty
Quarryville Access																					
7-79	55.8	25.7			0.1	5.5	0.6		1.8					5.1	1.0					4.4	
8-79	81.0	10.9			0.1	0.4	0.1	0.1	3.9					1.6	1.0			0.2		0.7	
9-79	62.6	15.1	5.2	2.4		0.9	1.1	1.1	0.4						1.0			0.6	0.1	10.6	
10-79	74.5	7.3	10.1													1.1				7.0	
11-79	3.1	15.6							66.7											14.6	
Holston River Mile 89.9																					
7-79	58.3	18.8			1.0	6.3	0.5	5.9	1.1						1.6		0.3	0.7	0.1	5.4	
8-79	92.1	3.2			1.8	0.7									0.2			0.2		1.8	
Fall Creek Access																					
7-79	51.3	12.8	17.4	1.6	0.5	1.2	0.4	8.8	2.8	0.4		2.7		0.1	1.3					1.4	
8-79	53.4	8.6	0.1		0.4	0.3		0.3	22.2						6.5			0.3		5.2	
9-79	10.1	7.7	0.9			2.2	0.7	63.3	4.3						2.6			0.3		7.9	
10-79	0.5	0.5	6.4					92.1												0.5	
11-79									100.0												
12-79	25.0								25.0			12.5			6.3					31.2	
County Line Access																					
7-80	14.4	6.2	12.6		0.3		4.1	15.9	15.2	2.7				22.3						6.3	
8-80	5.0	38.9							31.7			2.9			11.6					9.9	
Oak Grove Access																					
2-80	16.7	16.7																		16.7	49.9
3-80	81.5	0.6			3.3				6.7			0.4			1.3					6.2	
Twin Islands																					
4-80	19.3	8.6	4.9			56.3	0.1	6.9	1.0			0.1			1.2					1.6	
Holston River Mile 56																					
5-80	20.0	11.1							42.8											26.1	
Holston River Mile 94																					
8-80	30.8	12.7	11.7			19.9		8.6						0.6	6.9	6.6				2.2	
Holston River Mile 89																					
7-80	65.6	8.4	10.8			1.9									4.2	4.9				4.2	
3-80	25.8	18.4	3.3			13.0	1.1	1.2	17.1			1.6			2.9	1.5			1.0	9.9	3.2
Holston River Mile 86																					
9-80	9.0	19.8	20.4			15.0	3.1	0.3	4.4				0.8		1.3				13.9	8.8	3.2
Holston River Mile 72																					
8-80	61.9	12.5	13.0						12.6												
Holston River Mile 85																					
8-80	20.3	18.5	24.4			7.2	3.6	3.6	6.4						2.9	5.1				8.0	
Holston River Mile 78																					
8-80	23.6	8.5	9.4			1.1		38.7	3.8					1.2	1.5	0.1				7.6	4.5
10-80	6.7	21.9	8.2			3.2	0.4	3.8	5.6						3.2					30.9	16.1
Holston River Mile 80																					
10-80	6.5	18.2	27.6			24.8	0.2	7.1	3.2						0.4					5.6	6.4
Holston River Mile 81																					
10-80	2.5	21.6	17.8			6.4		14.0	12.0						0.3	0.1			10.4	8.4	6.5
Hamblen County Access																					
12-80	3.3	12.8							25.3						3.4					32.9	22.3
Holston River Mile 70																					
1-81																					100.0

Table 7. Food Items Consumed (by Actual Numbers) by Hybrids at Each Collection Site from July 1980 Through January 1981.

Collection Site and Date	Chironomidae larvae	Chironomidae pupae	*Chaoborus* larvae	Ostracoda	Cladocera	*Argulus*	Copepoda	Clupeidae	Centrarchidae	*Notropis*	Larval fish	Unidentified fish	Ephemeroptera	Hymenoptera pupae	Miscellaneous	Empty
Holston River Mile 89																
7-80	33.1	28.3											26.9		11.7	
8-80	75.0	21.4													3.6	
County Line Access																
7-80	18.7	14.9	13.1	2.3	0.7	0.6	22.9	13.6	0.5	0.5	0.6	1.4	0.1		10.1	
8-80	44.4	28.9		1.6				13.1							12.0	
Holston River Mile 85																
8-80	3.1	15.4	1.5		7.2	0.7							62.5		9.6	
Holston River Mile 72																
8-80	2.3	96.9													0.8	
Holston River Mile 94																
8-80	50.0														50.0	
Holston River Mile 78																
8-80	4.6	48.3				11.1	8.9	1.7			7.9		4.4		13.2	
10-80	11.6	34.3				25.0	29.1									
Holston River Mile 86																
9-80	25.8	14.9				35.4							14.3		9.6	
Fall Creek Access																
10-80	28.4					71.6										
Holston River Mile 80																
10-80	5.2	28.7		1.3		30.4	13.5						4.5		16.4	
Holston River Mile 81																
10-80	6.4	24.6	1.7	1.6		0.1	2.8	14.2				3.9	1.5	20.6	22.6	
Hamblen County Access																
12-80	1.7	4.0	6.0					38.0				10.7			39.6	
Holston River Mile 70																
1-81	5.4							15.4							28.9	50.0

only consumed Chironomidae at most sites, but also Ephemeroptera (mainly Siphlonurus), Crustacea, and fish (mainly Clupeidae). In most cases, both hybrids and white bass consumed fish at sites where they were present. White bass appeared to be more piscivorous in July and August 1980 than hybrids. This could be explained by the fact that white bass collected comprised several age classes. September and October 1980 samples indicated hybrid food habits shifted to the copepod Argulus. While Chironomidae was an important food source during this period, this shift in diet towards Argulus, and fish at some sites, indicated a consumption of larger food items. White bass at the same sites did not ingest as many Argulus and sometimes ate Chaoborus more frequently. Again, white bass had a more varied diet. Hybrids consumed a more pronounced majority of fish, especially Clupeidae, from October 1980 through January 1981. White bass also ingested fish during this time, although many stomachs were empty on examination. This most probably was due to low forage bases at collection sites or possibly their inability to successfully compete with the more aggressive hybrids.

Chironomidae were consistently found as the primary food item in black bass (Table 8). In some cases, terrestrial insect pupae (probably Hymenoptera) and larval fish became almost as important as Chironomidae. Some of the fish consumed were Notropis, again reflecting a shore-oriented feeding pattern. Striped, white, and hybrid bass rarely consumed Notropis.

Table 8. Food Items Consumed (by Actual Numbers) by Black Bass at Each Collection Site from July 1979 Through October 1980.

Collection Site and Date	Chironomidae larvae	Chironomidae pupae	*Chaoborus* larvae	Ostracoda	Cladocera	*Argulus*	Copepoda	Clupeidae	Centrarchidae	*Notropis*	Unidentified fish	Ephemeroptera	Hydracarina	Neuroptera larvae	Hymenoptera pupae	Miscellaneous	Empty
Quarryville Access																	
7-79	82.8	10.5						6.3								0.4	
8-79	82.6	11.0	3.2	1.5		0.5		0.3					0.5			0.4	
9-79	20.8	25.6						42.9							9.2	1.5	
10-79	29.9	27.0													40.1	3.0	
Holston River Mile 89.9																	
7-79	44.0	56.0															
8-79	55.7	43.5								0.2						0.6	
Fall Creek Access																	
7-79	32.2	48.2		2.8	9.4						2.1				3.3	3.0	
8-79	45.2	35.0									3.4				12.8	3.6	
9-79	21.4	71.4														7.2	
10-79	19.4	59.4													13.0	8.2	
County Line Access																	
7-79	42.9	8.1		11.4			35.4								2.2		
10-79	6.3	88.6										3.2			1.8	0.1	
7-80	61.2	31.4									1.8					5.6	
8-80	53.5	30.1		7.0						6.6					2.8		
Holston River Mile 89																	
7-80	58.3	33.3												4.2		4.2	
8-80	88.5	11.5															
Holston River Mile 94																	
8-80	61.1	8.3							11.1							19.5	
Holston River Mile 85																	
9-80	16.4	25.4						9.1		4.5	9.1				21.3	14.2	
Holston River Mile 86																	
9-80		9.4								6.7					76.5	7.6	
Holston River Mile 78																	
10-80	13.2	29.3				11.1				10.7	2.5				9.3	12.8	11.1
Holston River Mile 80																	
10-80		42.5													7.5	10.0	40.0

Food habits by length class. If striped bass are divided into 2.5 cm length classes, food habits of different length fish can be determined (Table 9). There were several length class shifts from one food item to another. Fish from 2.6 to 5.0 cm consumed a diet of Crustacea, while fish from 5.1 to 10.0 cm ate Chironomidae. Fish from 10.1 to 15.0 cm exhibited a gradual shift from Chironomidae back to Crustacea, while those from 15.1 to 17.5 cm ingested Chironomidae again. These shifts can be explained by cyclic peaks in population numbers or availability of these organisms.

Clupeidae were the primary food source for striped bass above 20 cm. A comparison of this data with other similar studies of striped bass food habits is presented in Table 10. Studies by Stevens (1965), Wigfall and Barkuloo (1975), Higginbotham (1979), Pelren (1981), Humphries and Cumming (1971), and Gomez (1970), indicated preferences for Crustacea and Chironomidae at smaller length classes. Most refer to a diet shift from Crustacea and aquatic insects to fish at a smaller size (100 to 150 mm) than was found in this study. This could be explained by low numbers of fish prey species in areas preferred by striped bass or by large numbers of white bass out-competing smaller striped bass for fish prey available. Hybrids ingested large quantities of Copepoda when these fish were between 2.6 and 5.0 cm in length (Table 11). A gradual shift from Crustacea to Chironomidae occurred from 5.1 to 12.5 cm in length. Fish became evident in hybrid diets at 5.1 cm and were increasingly more important as the hybrid grew larger. Hymenoptera pupae appeared important to 15.1 to 17.5 cm fish probably because of their presence in large numbers at the

Table 9. Striped Bass Food Consumption (by Actual Numbers) by Length Classes.

Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
Chironomidae larvae	7.4	73.8	76.6	47.5	1.9	100.0		33.3			
Chironomidae pupae	1.1	9.3	7.4	6.3	0.5			8.3			
Chaoborus larvae			1.0	2.1	0.9						
Ostracoda		0.1	0.3	2.1							
Cladocera	14.9	9.6	1.6	41.0	61.0						
Argulus	4.2		0.2	0.1							
Copepoda	68.1	2.5	6.9		35.5						
Clupeidae								58.4		58.3	66.7
Morone chrysops											25.0
Ephemeroptera					0.2						
Neuroptera larvae			0.8								
Hymenoptera pupae		0.3	0.6	0.2							
Hydracarina		0.6	0.7	0.4							
Miscellaneous	4.3	3.8	3.9	0.3						41.7	8.3

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

Table 10. Published Food Item Selection by Young-of-Year Striped Bass.

Author	Study Location	Fish Length (mm)	Food Item
Present study	Cherokee Reservoir, TN	35-180	Chironomidae
Higginbotham (1979)	Watts Bar Reservoir, TN	44-182	Crustacea, Clupeidae
Pelren (1981)	Tims Ford and J. Percy Priest Reservoirs, TN	90	Crustacea, fish
Weaver (1975)	J. Percy Priest Reservoir, TN	y-o-y	Clupeidae
Wigfall and Barkuloo (1975)	Choctawhatchee River, FL	y-o-y	Crustacea, Clupeidae
Humphries and Cumming (1973)	North Carolina culture ponds	10-30	Copepoda
		30-80	Cladocera
		80-100	Insect larvae
		over 100	Fish, insect larvae
Harper and Jarman (1971)	Oklahoma culture ponds	10-50	Copepoda
		20-110	Cladocera
		over 80	Insects
		over 100	Fish
Ware (1970)	Florida	76-350	Clupeidae
Gomez (1970)	Canton Reservoir, OK	53-100	Diptera (*Chaoborus*, Chironomidae)
Stevens (1965)	Santee-Cooper Reservoir, SC	95	Chironomidae larvae

Table 11. Hybrid Bass Food Consumption (by Actual Numbers) by Length Classes.

Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
Chironomidae larvae	35.8	25.7	18.0	11.7	10.8		5.9	6.2			
Chironomidae pupae	0.2	14.6	25.3	34.9	16.1		10.4	11.8			
Chaoborus larvae		11.8	5.5	4.8			3.9	2.9			
Ostracoda		2.4	1.9	0.3							
Cladocera		1.1	1.0								
Argulus		2.2	6.1	5.8							
Copepoda	64.0	26.4	5.9								
Clupeidae		2.4	8.9	19.8	45.8	50.0	44.9	42.4	46.7	50.0	
Centrarchidae		0.3	0.5								
Notropis			0.4								
Larval fish		0.3	1.7	1.9							
Unidentified fish		1.3	1.6	0.9	11.1		5.9	5.9	12.2		
Ephemeroptera		5.1	10.2	1.1							
Hymenoptera pupae			3.5	11.4		47.8	15.6	9.8			
Miscellaneous		6.4	9.5	7.4	16.2	2.2	7.5	9.2	7.8		
Empty							5.9	11.8	33.3	50.0	

[a]Length classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

collection site. Hybrids showed a more gradual shift to fish as their principal food when compared to striped bass which changed abruptly. This could be due to the fact that larger numbers of hybrids were collected than striped bass. Studies by Bishop (1967), Williams (1971), Ware (1974), and Crandall (1978) revealed that Clupeidae were the preferred food for hybrids.

White bass between 2.6 and 5.0 cm consumed Crustacea and Chironomidae in approximately the same proportions (Table 12). This may indicate a more opportunistic feeding pattern compared to striped or hybrid bass and their (white bass) consumption of Crustacea only. White bass from 5.1 to 25.0 cm ingested Chironomidae in relatively constant amounts, indicating that this item remained important throughout their first three growing seasons. As with hybrids, fish appeared in white bass diets at 5.1 cm length classes, but never gained the importance that was noted in hybrids and in larger length classes of striped bass. White bass (and sometimes striped bass) showed a slight inclination towards cannibalism (consuming white bass).

A comparison of white bass food habits examined in this study is presented in Table 13. Ruelle (1971) revealed that white bass in Lewis and Clark Reservoir, South Dakota, prefer fish after the white bass has attained 90 mm in length. The present study revealed a four fold increase in fish consumption in approximately the same length classes. Young-of-year white bass in Cherokee Reservoir did not consume over 30% fish in their diets.

When food habits of the different length classes of striped, white, and hybrid were analyzed by monthly collections, general trends

Table 12. White Bass Food Consumption (by Actual Numbers) by Length Classes.

Food Organisms	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
Chironomidae larvae	36.6	42.1	37.4	29.4	18.3	18.1	26.0	44.3	38.8		25.0
Chironomidae pupae	1.3	12.1	20.5	19.4	13.5	15.2	8.1	7.3			
Chaoborus larvae		13.6	8.6	3.6	0.2	0.5	1.0				
Amphipoda		0.2	0.4								
Ostracoda		0.3	0.1				1.7				
Cladocera	4.6	9.9	2.2	14.9	4.8	1.7					
Argulus		1.2	2.2	0.1	0.1	0.2					
Copepoda	37.5	10.5	13.3	2.8	0.3	0.3					
Clupeidae		1.1	2.4	11.0	26.7	22.7	9.8	13.9	38.3		32.1
Centrarchidae	10.0		0.3	0.2							
Morone chrysops			0.3	0.3	2.3	1.6	1.0	0.1			
Ictalurus punctatus						0.4					
Larval fish		1.9	3.2				1.0				
Unidentified fish		0.4	0.9	4.9	3.5	1.7	6.6	0.2	0.4		11.0
Ephemeroptera		0.9	1.3	0.6	0.6						
Neuroptera larvae		0.1	0.2	0.2	0.1						
Hymenoptera pupae		0.3	2.2	1.0	0.8	5.2					
Hydracarina		0.1									
Miscellaneous	10.0	5.3	4.5	9.7	16.5	13.6	15.9	15.6	22.5		6.9
Empty				1.9	12.3	18.8	28.9	18.6		100.0	25.0

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

Short

Table 13. Published Food Item Selection by Young-of-Year White Bass.

Author	Study Location	Fish Length (mm)	Food Item
Present study	Cherokee Reservoir, TN	35-140	Chironomidae
Griswold and Tubb (1977)	Sandusky Bay, OH	y-o-y	Fish, aquatic insects
Olmsted and Kilambi (1971)	Beaver Reservoir, AK	y-o-y	Fish, aquatic insects, Crustacea
Ruelle (1971)	Lewis and Clark Reservoir, SD	up to 50	Crustacea
		50-100	Chironomidae
		over 90	Fish
Priegel (1970)	Lake Winnebago, WI	y-o-y	Zooplankton
Moser (1968)	Lake Texoma, OK	y-o-y	Crustacea, fish
Webb and Moss (1967)	Center Hill Reservoir, TN	y-o-y	Larval fish

were noted (Appendices C, D, and E). Striped, white, and hybrid bass utilized Chironomidae and Crustacea extensively up to approximately 10 cm. White bass and hybrids began utilizing fish at 7.6 and 10.0 cm, respectively, while striped bass did not begin using fish until 20 cm. White bass and hybrids attained these sizes in late summer or early fall while striped bass were almost 1^+ before they utilized forage fish.

It was noted in smaller fish of equal length that white bass were heavier and had a larger mouth than striped bass. This would enable the white bass, up to a point in time, to out-compete striped bass for fish as food. On the other hand, white bass and hybrids were usually around the same size until the end of summer, when hybrids began to grow faster. Competition was probably a factor until the hybrids grew a little larger than the white bass.

Electivity indices (Ivlev 1961) were examined for striped, hybrid, and white bass (Appendices F-N). A positive (+) value (Appendices F-H) was found to reflect a selection for a particular food item. The item was consumed in higher numbers than was found in the environment. A negative (-) value (Appendices I-K) meant that an item was selected against or that the food item was found in higher numbers in the environment than in the gut sample. A zero (0) value (Appendices L-N) indicated a neutral selection for a particular food item. This meant that a food item appeared in the gut sample in approximately the same numbers that it appeared in the environment. This index tended to be biased towards collections with fish in the gut samples; since fish rarely appeared in plankton and substrate samples, the electivity index would approximate +1 and therefore imply that there was strong selection for that particular species. This index did not represent the actual utilization of Chironomidae because due to high numbers of this food item in both the gut sample and environment, it often appeared as a neutral item or even a negative item.

As noted by these indices, striped bass selected a more restricted diet than hybrids or white bass. Hybrids and white bass also switched to a piscivorous diet much sooner than striped bass. Most competition was assumed to be between hybrids and white bass over fish as prey. They both selected for similar species within the same length classes. There could have been some competition between striped and white bass over invertebrates, but larger striped bass would probably out-compete smaller white bass for fish prey.

Growth

Striped bass were stocked in June 1979 with a mean length of 3.5 cm. One year later, striped bass (n=3) were captured with a mean length of 21.7 cm. Striped and hybrid bass were stocked in June 1980 with mean total lengths of 3.0 cm and 4.5 cm, respectively. Seven months later hybrids (n=19) were collected averaging 21.5 cm in total length. This indicated that hybrids grew much faster, having attained similar sizes to striped bass in a much shorter interval. There were no striped bass collected in 1980. Since collecting methods were similar to those employed for hybrids, it was assumed they experienced poor survival. White bass lengths ranged from 3.5 to 6.5 cm when striped and hybrid bass were stocked. This could account for some competition at stocking sites for Chironomidae and Crustacea prey. This could be a limiting factor for optimum growth for striped bass. Due to the nature of hybrids, this competition was probably negligible.

Striped, hybrid, and white bass growth in the first growing season was verified by scale analysis. Striped bass growth in Cherokee Reservoir compared favorably to most published data for the species (Table 14). Differences could be accounted for in general by diet preferences and forage bases in other parts of the country. Estimates for one year's growth in striped bass were relatively close in all four Tennessee studies. In most cases, length estimates for anadromous populations were lower than Cherokee values and, on the whole, less than those of landlocked populations.

Hybrid growth in Cherokee Reservoir after seven months (21.5 cm) compared very closely to Bishop's (1967) reported value of 21.3 cm for the same time interval. He also found that hybrids in Cherokee Reservoir could reach the length of 35.8 cm in one year. This was higher than Crandall's (1978) estimate of 30.3 to 35.1 cm hybrid bass in Lake Bastrop, Texas, and lower than Williams' (1971) estimates of 37.1 and 44.7 cm for Lakes Hartwell and Clark Hill, South Carolina, respectively. Ware (1974) determined that hybrids grew to 36.3 cm in one year in Florida, a figure very close to Bishop's 35.8 cm. Based on seven months of data, hybrids in Cherokee Reservoir grew to lengths comparable to those attained by fish in past years; this growth was considered near optimal for hybrids in this reservoir.

Table 14. Published Growth Estimates of Striped Bass.

Author	Study Location	Actual or Back-calculated Total Length (mm) at Age 1
Present study	Cherokee Reservoir, TN	217
Higginbotham (1979)	Watts Bar Reservoir, TN	182
Axon (1979)	Herrington Lake, KY	280
TVA (1975)	Cherokee Reservoir, TN	175
Weaver (1975)	J. Percy Priest Reservoir, TN	216
Smith (1973)	Savannah River, GA	163 (152)[a]
Humphries and Cumming (1973)	Culture ponds in Weldon, NC	170
Erickson et al. (1971)	Keystone Reservoir, OK	279 (261)[a]
Bason (1971)	Delaware Estuary	109 (102)[a]
Neal (1971)	Kerr Reservoir, OK	212 (198)[a]
Mensinger (1970)	Keystone Reservoir, OK	259
Ware (1970)	Florida	282
Chadwick (1966)	Sacramento-San Joaquin River System, CA	97 (91)[a]
Heubach et al. (1963)	Sacramento-San Joaquin River System, CA	122 (114)[a]
Trent (1962)	Albemarle Sound, NC	100
Mansueti (1961)	Chesapeake Bay, MD	139 (130)[a]
Stevens (1957)	Santee-Cooper Reservoir, SC	231 (216)[a]
Scruggs (1955)	Santee-Cooper Reservoir, SC	198
Vladykov and Wallace (1952)	Chesapeake Bay, MD	118 (110)[a]
Merriman (1941)	New England and Long Island	114
Merriman (1941)	Hudson River, NY	292
Scofield (1928)	California	104 (97)[a]

[a]All numbers in parentheses are measured fork lengths (FL) of fish in study; total length (TL) was calculated by using the conversion factor 1.07 for FL to TL (Mansueti 1961).

White bass, however, only attained a mean length of 14.0 cm during the first year of growth in Cherokee Reservoir. This estimate appeared to be somewhat lower than most published data and the least growth found in any Tennessee reservoir study (Table 15). This reduced growth, when compared to other Tennessee estimates, could be due to overcrowding of white bass as 1979-1981 appeared to be "boom years" in terms of numbers of white bass produced. While white bass appeared to have a jump in growth on stocked striped and hybrid bass, they were overtaken in length within the first 6 months after stocking. However, it has been speculated that during years of high white bass numbers, low numbers of striped bass are the result (Bishop and Peterson, personal communication).

Weight-length relationships for striped bass, hybrids, and white bass were as follows: Log W = -2.401 + 3.355 Log L, Log W = -2.225 + 3.191 Log L, and Log W = -5.081 + 3.073 Log L, respectively. In all cases, the slopes were greater than 3.0, the slope for isometric growth. Slopes greater than 3.0 are considered allometric, therefore more weight was gained per length increment for all fish during their first year. Weaver's (1975) study on J. Percy Priest Reservoir, Tennessee, revealed a weight-length formula of Log W = -3.660 + 3.200 Log L for adult striped bass. This slope was similar to young-of-year striped bass in Cherokee Reservoir. Kerby (1971) found that Rappahanock River, Virginia, hybrids had a weight-length formula of Log W = -5.081 + 3.073 Log L which was similar to Cherokee hybrids. A study of white bass on Dale Hollow Reservoir, Tennessee, by Myhr (1971) revealed a weight-length relationship of Log W = -5.251 + 2.958 Log L, which was

Table 15. Published Growth Estimates of White Bass.

Author	Study Location	Actual or Back-calculated Total Length (mm) at Age 1
Present study	Cherokee Reservoir, TN	140
Baglin and Hill (1976)	Lake Texoma, OK	211
TVA (1975)	Cherokee Reservoir, TN	150
Olmsted and Kilambi (1971)	Beaver Reservoir, AK	245
Ruelle (1971)	Lewis and Clark Lake, SD	108
Myhr (1971)	Dale Hollow Reservoir, TN	193
Priegel (1970)	Lake Winnebago, WI	97
Pelren (1970)	Pool 19, Mississippi River	139
Houser and Bryant (1970)	Bull Shoals Reservoir, TN	190
Webb and Moss (1967)	Center Hill Reservoir, TN	206
Nichols and Turner (1966)	Dale Hollow Reservoir, TN	178
Forney and Taylor (1963)	Oneida Lake, NY	135
Moyle (1952)	Minnesota	94
Tompkins and Carter (1951)	Kentucky	173
Tompkins and Peters (1951)	Herrington Lake, KY	213
Patriarche (1951)	Norfolk Lake, MO	178
Sigler (1949)	Spirit Lake, IA	129
Van Oosten (1942)	Lake Erie, NY	119
Van Oosten (1942)	Norris Lake, TN	160
Roach (1948)	Ohio	140
Howell (1945)	Wheeler Reservoir, AL	155

less than, but not very different than Cherokee white bass. It should be noted that the hybrid weight-length formula was based on 7 months' data.

Condition

Condition factors for striped, hybrid, and white bass of different length classes are presented in Table 16. While values for striped and hybrid bass may be comparable for young-of-year fish, values for similar size white bass may not be directly comparable due to their difference in body shape. Mean condition factors (K) for striped bass for their first year of growth ranged from 0.8 to 1.3. These values closely approximated Weaver's (1975) estimates for striped bass in J. Percy Priest Reservoir, Tennessee (0.8 to 1.6) and those determined for young-of-year in the Hudson River (Texas Instruments 1973) which had values ranging from 0.9 to 1.2. However, they were somewhat less robust than fish in Florida (Ware 1970) which had condition factors of 1.3 to 2.7.

Hybrids in Cherokee Reservoir had condition factors (K) similar to the striped bass, ranging from 0.9 to 1.2. These values were slightly less than those determined for Lake Bastrop, Texas, hybrids of 1.1 to 1.4 (Crandall 1978). This discrepancy could have resulted from an inflated K value attained from the first year hybrids stocked in Lake Bastrop. It should be noted that the initial high condition factor of small hybrids (1.1) was probably due to their larger size and plumpness at stocking and the small sample size.

White bass condition factors (K) in Cherokee Reservoir ranged from 0.9 to 1.3 and were slightly lower when compared to Pelren's

Table 16. Mean Condition Factor (K) for Striped, Hybrid, and White Bass in 2.5 cm Length Classes.

Length (cm)	N	Striped Bass	N	Hybrid	N	White Bass
2.6-5.0	1	0.76	2	1.11	5	0.90
5.1-7.5	15	0.77	62	0.89	264	0.99
7.6-10.0	40	0.87	57	0.86	169	1.02
10.1-12.5	5	0.91	23	0.89	53	1.13
12.6-15.0	2	1.08	9	0.96	65	1.21
15.1-17.5	1	1.15	2	1.16	64	1.17
17.6-20.0			17	1.08	52	1.16
20.1-22.5	2	1.07	17	1.06	27	1.21
22.6-25.0			15	1.15	4	1.19
25.1-27.5	2	1.05	2	1.06	1	0.85
above 27.5	4	1.28			4	1.32

(1970) data on white bass from Pool 19 of the Mississippi River which ranged from 1.2 to 1.3. However, overall condition of white bass in Cherokee was higher than values for striped bass and hybrids. This was probably due to the greater body depth and possibly the earlier, natural spawning of white bass as opposed to the later, hatchery-reared striped bass and hybrids. Drops noted in condition factors for striped and hybrid bass between 22.6 and 25.0 cm could have been due to less forage available during the winter or early spring.

Movements and Habitat Preferences

After stocking striped bass at Quarryville access in June 1979 a general trend of downstream movement was noted. Fish were collected at Quarryville up to 4 months after stocking. Two months after stocking, fish had spread from Quarryville access to Fall Creek access, 16 km downstream. Young-of-year striped bass were caught for two more months at Fall Creek access. After October, no striped bass were captured until February 1980, 8 months after stocking. Fish captured in February (mean length 17.5 cm) were caught in gill nets in 6.1 to 7.6 m of water. Mensinger (1970) often caught striped bass at this depth in Keystone Reservoir, Oklahoma. Higginbotham (1979) found that striped bass from 160 to 180 mm began to spend more time away from shore. This collection of striped bass in February 1980, 34 km from the stocking site in deeper water, reflected downstream movement, from shallower waters the first 4 months after stocking to deeper waters during the next 4 months. From February 1980 through August 1980, fewer striped bass were captured than the period following stocking; all of the fish captured were in at least 6 m of water or deeper (in gill nets). The greatest distance a young-of-year fish was captured from the original stocking site was 59 km downstream, some 10 months later. These observations indicated a relatively good dispersal of fish throughout the lake.

The theory that young striped bass tend to school shortly after stocking and break up into smaller groups as they grow larger tends to be supported by observations on Cherokee Reservoir. Striped bass were noted to school again after reaching weights of 2 to 3 kg. The so-called disappearance of one- to two-year-old classes common in many studies (Coutant, personal communications) was also noted in this study. Only eight fish captured in this study could be classified as one- or two-year-olds.

During the 4 months following stocking, young-of-year striped bass were captured on or adjacent to access ramps in shallow water. Many times these fish could be observed feeding at the interface of the substrate and water column. It should be noted that collections with the seine during this period could have been biased towards somewhat smaller fish as larger fish were often in deeper water or outran the seine. Scofield (1928), Rathjen and Miller (1957), and Boynton et al. (1981) found that young-of-year striped bass were often captured on mud flats, or in sheltered coves with soft or sticky bottoms, or near shore. Due to the 1979 season of high water, large areas around access ramps were flooded. These areas gave rise to a tremendous surge in Chironomidae production, hence the feeding activity at the interface. Areas frequently utilized by young-of-year striped bass could be categorized as a clay-sand substrate with a shallow layer of muddy organic matter. Higginbotham (1979) found that striped bass in Watts Bar Reservoir, Tennessee, preferred sandy-gravely substrates. After older fish had moved to deeper waters in Cherokee, they were often captured on clay-sand points with or without rock and gravel.

No striped bass were captured after their stocking at Quarryville in June 1980. Only hybrids stocked at the same time, at County Line access, were collected. One reason striped bass were not captured during the 1980 to 1981 season could have been that water levels were much lower than the previous year and fewer shallow areas existed, hence a lower number of food organisms produced. The stocking area for striped bass was more riverine during the 1980 season. It is possible that all striped bass stocked this season could have starved to death or they may have been subjected to heavy predation. It could also be noted that half the number of striped bass were stocked in 1980 as were stocked in 1979. Twice the amount of shoreline was seined in 1980 than in 1979 because many ramps seined in 1979 were out of the water and no fish were found at ramps that were in the water. This necessitated collections in the reservoir along muddy banks inaccessible by truck. These collection methods revealed large numbers of hybrids, but no striped bass. Hybrids preferred the same substrate types as striped bass, although they (hybrids) were captured more often on muddy banks than on ramps. Hybrids could be seined effectively until October 1980, when they moved to deeper water. After October, they could be captured in gill nets in the same type areas preferred by striped bass. As with striped bass, hybrids could often be observed at the interface between the substrate and the water column.

White bass were almost always captured with striped and hybrid bass. Schools of striped and white bass or hybrid and white bass were usually encountered. These observations support the possibility of competition between these species for limited species of fish prey.

CHAPTER VI

SUMMARY

1. Of 109,675 striped bass stocked at Quarryville in June 1979, 70 fish were recovered. Of 80,480 striped bass stocked at Quarryville in June 1980, 0 fish were recovered. Of 80,000 hybrids stocked at County Line in June 1980, 206 were recovered.

2. Chironomidae larvae and pupae were the primary foods of young-of-year striped bass, hybrids, and white bass. Crustacea were consumed periodically shortly after stocking and during the winter and spring months. Striped bass switched from an invertebrate diet to a fish diet at 20 cm or approximately one year after stocking. Fish first appeared in hybrid diets at 5.1 cm and grew increasingly important with increased size. Hybrids consumed fish shortly after stocking when fish prey were available. White bass consumed fish when they (white bass) attained a size of approximately 5.1 cm, shortly after striped bass and hybrids were stocked.

3. Striped bass, hybrids, and white bass were often observed feeding at the interface between the substrate and the water column. Preferred substrates ranged from a sand-clay mixture to a muddy-soft mixture. Ramps and areas adjacent to ramps were also preferred areas.

4. Striped bass attained a length of 21.7 cm after one year's growth in Cherokee Reservoir. Hybrids attained a similar length, 21.5 cm, after only 7 months growth. White bass grew to approximately 14.0 cm in one year.

5. Condition factors (K) were very similar for striped bass and hybrids, although hybrids had larger values shortly after stocking (due to larger stocking sizes). White bass condition factors were slightly larger than those of striped bass and hybrids probably because of their body depth and possibly due to their earlier spawning season.

6. Striped bass tended to move downstream and to deeper waters with age. Five months after stocking, striped bass had moved away from stocking areas. Hybrids tended to move to deeper water earlier (3 months) than striped bass and moved upstream and downstream shortly after stocking.

7. Since striped bass did not consume fish during their first year after stocking, it is recommended that striped bass be stocked at smaller sizes (advanced fry) earlier than June, as soon as Crustacea and Chironomidae levels increase, or that they be stocked at larger sizes as early as possible if sufficient numbers of fish prey are available and very few predators are larger than the striped bass. Early small striped bass stocking (2.5 cm) would enable them to take advantage of invertebrate numbers and possibly attain a growth advantage over white bass. Early larger striped bass stocking (5.0 cm) would enable them to eat available smaller fish fry if low (smaller) predator concentrations and high forage numbers were present near stocking sites.

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APPENDIXES

APPENDIX A

Table 17. Total Percentages of Food Items (by Actual Numbers) Selected by White and Black Bass Captured at Sites Where Striped and Hybrid Bass Were Not Collected.

Food Organisms	White Bass	Black Bass
Chironomidae larvae	56.1	34.6
Chironomidae pupae	17.3	26.9
Chaoborus larvae	1.8	
Ostracoda	0.2	
Cladocera	2.3	7.7
Argulus	0.1	
Clupeidae	7.5	0.3
Notropis	1.0	3.8
Unidentified fish	7.2	
Ephemeroptera	0.2	0.2
Hymenoptera pupae	1.0	24.3
Miscellaneous	5.3	2.2

APPENDIX B

Table 18. Frequency of Occurrence (Percent of Total) of Food Items Selected by White and Black Bass Captured at Sites Where Striped and Hybrid Bass Were Not Collected.

Food Organisms	White Bass	Black Bass
Chironomidae larvae	33.3	29.8
Chironomidae pupae	27.1	27.7
Chaoborus larvae	4.2	
Ostracoda	2.1	
Cladocera	2.1	6.4
Argulus	2.1	
Clupeidae	8.3	4.3
Notropis	2.1	6.4
Unidentified fish	6.3	
Ephemeroptera	4.2	4.3
Hymenoptera pupae	2.1	12.8
Miscellaneous	4.0	8.3

APPENDIX C

Table 19. Striped Bass Food Consumption (Percent) by Length Class and Month (n=72).

Month-Year	Length Class[a]										
Food Organisms	1	2	3	4	5	6	7	8	9	10	11
July 1979											
Chironomidae larvae	7.4	73.6	67.3								
Chironomidae pupae	1.1	8.1	17.8								
Chaoborus larvae			2.2								
Cladocera	14.9	10.0	2.6								
Argulus	4.2										
Copepoda	68.1	4.2									
Hymenoptera pupae			0.5								
Hydracarina		1.0	3.6								
Miscellaneous	4.3	3.1	6.0								
August 1979											
Chironomidae larvae		73.2	87.9	87.9							
Chironomidae pupae		9.3	4.3	12.1							
Ostracoda		0.3	0.2								
Cladocera		10.7	1.0								
Argulus			0.3								
Copepoda			0.4								
Hymenoptera pupae		1.0	0.7								
Neuroptera larvae			1.2								
Hydracarina			0.1								
Miscellaneous		5.5	3.9								
September 1979											
Chironomidae larvae			38.1	19.6							
Chironomidae pupae			47.6	4.4							
Chaoborus larvae			14.3								

Table 19 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
September 1979 (cont.)											
Cladocera				72.8							
Hymenoptera pupae				1.1							
Hydracarina				1.1							
Miscellaneous				1.0							
October 1979											
Chironomidae larvae			0.9								
Chaoborus larvae			3.5								
Ostracoda			1.7								
Cladocera			5.0								
Copepoda			88.1								
Miscellaneous			0.8								
November 1979											
Clupeidae											100.0
December 1979											
Clupeidae											100.0
February 1980											
Chironomidae larvae						100.0					
March 1980											
Chironomidae larvae								66.7			
Chironomidae pupae								16.6			
Clupeidae								16.7			
April 1980											
Chironomidae larvae				43.4	3.9						
Chironomidae pupae				5.0	0.5						
Chaoborus larvae				3.5	1.8						
Cladocera				44.1	82.5						
Argulus				0.1							

Table 19 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
April 1980 (cont.)											
Copepoda				3.5	11.1						
Ephemeroptera					0.2						
Hydracarina				0.3							
Miscellaneous				0.1							
June 1980											
Chironomidae pupae					0.5						
Cladocera					39.5						
Copepoda					60.0						
Clupeidae								100.0			
Morone chrysops											100.0
August 1980											
Clupeidae										58.3	66.7
Miscellaneous										41.7	33.3

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX D

Table 20. White Bass Food Consumption (Percent) by Length Class and Month (n=707).

Month-Year Food Organisms	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1979											
Chironomidae larvae		58.2	49.5	47.3	79.9						
Chironomidae pupae		19.8	20.1	16.0	12.0						
Chaoborus larvae		2.1	11.3	12.1							
Amphipoda		0.9									
Ostracoda		0.8	0.1								
Cladocera		6.6	2.3								
Argulus		0.6	0.5								
Copepoda		7.0	3.5								
Clupeidae			1.7	10.0							
Centrarchidae				1.0							
Larval fish			6.6								
Unidentified fish			1.9	5.1	2.2						
Neuroptera larvae		0.3	0.3								
Hymenoptera pupae			0.1								
Hydracarina		0.2									
Miscellaneous		3.5	2.1	8.5	5.9						
August 1979											
Chironomidae larvae		91.8	80.7	49.7	37.2	39.8	42.9				
Chironomidae pupae		5.7	13.9	15.4	8.4	13.9	14.8				
Chaoborus larvae			0.1								
Amphipoda			0.1								
Ostracoda		0.6	0.4								
Cladocera		0.3	0.7								
Argulus		0.1	0.1								

Table 20 (Continued)

Month-Year Food Organisms	Length Class[a]									
	1	2	3	4	5	6	7	8	9	10	11
August 1979 (cont.)											
Copepoda		0.3	0.1								
Clupeidae				16.9	25.4	19.0					
Morone chrysops				1.6	2.4	12.6	25.0				
Unidentified fish			2.7	4.8	3.3	11.3					
Neuroptera larvae		0.3	0.2	2.3	0.4						
Hymenoptera pupae		0.1	0.1								
Miscellaneous		0.8	0.9	10.3	18.3	3.4	17.3				
Empty					4.6						
September 1979											
Chironomidae larvae		77.0	34.4	37.3	20.0	16.7	50.0				
Chironomidae pupae		9.3	12.5	13.3	20.0	8.3					
Chaoborus larvae		4.8	3.3			4.2					
Amphipoda		0.9	1.5								
Cladocera			0.7								
Argulus		0.9	0.8	1.0		4.2					
Copepoda		0.9	41.4	30.1	26.7						
Clupeidae				1.9	13.3	39.9					
Unidentified fish				1.7			26.7				
Neuroptera larvae			0.4	2.1							
Hymenoptera pupae			0.1								
Miscellaneous		6.2	4.9	12.6	20.0	26.7	23.3				
October 1979											
Chironomidae larvae		76.7	42.8								
Chironomidae pupae		6.2	5.3								
Chaoborus larvae			3.2								
Copepoda			46.1								

Table 20 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
October 1979 (cont.)											
Ephemeroptera		1.6									
Miscellaneous		15.5	2.6								
November 1979											
Chironomidae larvae						6.3					
Chironomidae pupae						31.3					
Clupeidae					88.9	50.0					
Miscellaneous					11.1	12.4					
December 1979											
Chironomidae pupae					100.0						
Clupeidae						50.0					
Morone chrysops						25.0					
Unidentified fish							25.0				
Miscellaneous						25.0	75.0				
February 1980											
Chironomidae larvae								33.0			
Chironomidae pupae								34.0			
Miscellaneous								33.0			
Empty											100.0
March 1980											
Chironomidae larvae					60.0		83.9	78.2	95.2		99.9
Chironomidae pupae							0.9	1.4			
Ostracoda							7.4	0.4			
Clupeidae					20.0		0.4	12.9			
Morone chrysops							0.4	0.3			
Unidentified fish							2.3		1.6		0.1
Miscellaneous					20.0		4.7	6.8	3.2		

Table 20 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
April 1980											
Chironomidae larvae			1.5	2.3	3.4	37.5	35.3	74.6			
Chironomidae pupae			18.0	3.1	3.2	12.4	18.8	17.3			
Chaoborus larvae			0.4	3.6	4.0	6.1	25.0				
Cladocera			49.5	87.6	83.7	35.5					
Argulus			0.1	0.1	0.1						
Copepoda			30.5	3.2	5.4	6.9					
Clupeidae							5.9	3.6			
Morone chrysops						0.6					
Unidentified fish						0.6	12.5				
Miscellaneous				0.1	0.2	0.4	2.5	4.5			
May 1980											
Chironomidae larvae									60.0		
Chironomidae pupae								33.3			
Clupeidae								33.4	20.0		75.0
Miscellaneous								33.3	20.0		25.0
July 1980											
Chironomidae larvae	31.4	28.2	5.5	22.2							
Chironomidae pupae	1.6	7.3	4.5								
Chaoborus larvae		10.4									
Ostracoda		0.2									
Cladocera	5.7	0.1									
Argulus		3.4									
Copepoda	36.3	20.7	4.2								
Clupeidae		7.9	26.9	54.4							
Centrarchidae	12.5		2.8								
Larval fish		12.8	25.1								
Unidentified fish	4.0	1.4	14.2								

Table 20 (Continued)

Month-Year Food Organisms	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1980 (cont.)											
Ephemeroptera		1.7									
Miscellaneous	8.5	5.9	16.8	23.4							
August 1980											
Chironomidae larvae	57.9	30.4	22.6	28.0		3.0					
Chironomidae pupae		12.1	35.7	24.8	24.2	47.6					
Chaoborus larvae		17.3	11.5								
Cladocera		13.2	1.2								
Argulus		2.3	0.2								
Copepoda	42.1	16.3	2.4								
Clupeidae			4.5	16.0	39.7	24.9		50.0	50.0		
Morone chrysops					4.8						
Larval fish		1.5									
Unidentified fish		0.8		14.6	13.4	11.5					
Ephemeroptera		2.7	1.8	4.2	1.8						
Hymenoptera pupae			3.2								
Miscellaneous		3.4	7.9		11.4	13.0		50.0	50.0		
Empty			9.0	12.4	4.7						
September 1980											
Chironomidae larvae		9.3	10.7			3.0	50.0				
Chironomidae pupae		16.9	32.3	45.6		21.1					
Chaoborus larvae		42.2	20.2								
Cladocera		24.5									
Argulus			17.1								
Copepoda		0.5	7.1								
Clupeidae					35.0	14.7					
Centrarchidae							50.0				
Ictalurus punctatus						2.4					
Larval fish			4.9								

Table 20 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
September 1980 (cont.)											
Unidentified fish			0.3	1.3		15.4					
Hymenoptera pupae		4.5		50.6		25.6					
Miscellaneous		2.1	1.9	2.5	35.0	8.7					
Empty			5.5		30.0	9.1					
October 1980											
Chironomidae larvae		7.5	5.2			3.7					
Chironomidae pupae		12.2	42.5	61.7	10.0	11.9	14.1				
Chaoborus larvae		28.8	27.5								
Cladocera		23.3	4.6								
Argulus		1.2	0.6								
Copepoda		14.4	8.3								
Clupeidae		0.3				23.6	35.8				
Unidentified fish				4.2			13.8				
Ephemeroptera		0.1	0.1								
Hymenoptera pupae			10.1		15.0	3.3					
Miscellaneous		12.2	1.1	0.8		19.7	23.8				
Empty				33.3	75.0	27.8	12.5				
November 1980											
Chironomidae larvae						9.5					
Chironomidae pupae						14.3	10.7				
Clupeidae						14.3	3.6				
Unidentified fish						4.8					
Miscellaneous						14.3					
Empty						42.8	85.7	100.0			

Table 20 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
December 1980											
Chironomidae pupae				75.0			17.8	15.0			
Chironomidae larvae							8.2				
Clupeidae						31.3	23.5	25.0			50.0
Unidentified fish							8.3				
Miscellaneous				25.0		31.3	33.1	40.0			50.0
Empty						37.4	9.1	20.0		100.0	
January 1981											
Empty					100.0		100.0	100.0			

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX E

Table 21. Hybrid Bass Food Consumption (Percent) by Length Class and Month (n=206).

Month-Year	Length Class[a]										
Food Organisms	1	2	3	4	5	6	7	8	9	10	11
July 1980											
Chironomidae larvae	35.8	26.7	8.2	3.2							
Chironomidae pupae	0.2	13.0	20.4	20.9	33.3						
Chaoborus larvae		13.9	12.8	5.6							
Ostracoda		2.9	1.7								
Cladocera		1.0	0.8								
Argulus		0.8	0.5								
Copepoda	64.0	28.9	10.5								
Clupeidae		2.9	21.5	49.9	46.7						
Centrarchidae		0.4	0.7								
Larval fish		0.5	9.1								
Unidentified fish		1.5	1.5								
Ephemeroptera		2.6	1.8								
Miscellaneous		4.9	10.5	20.4	20.0						
August 1980											
Chironomidae larvae		21.8	29.9								
Chironomidae pupae		32.9	26.5	26.6	78.3						
Chaoborus larvae		1.3	0.4								
Ostracoda			0.8								
Cladocera		2.4	3.2								
Argulus			3.9								
Copepoda			2.8								
Clupeidae					13.1	100.0					
Larval fish				38.5							
Ephemeroptera		29.9	29.2								
Miscellaneous		11.7	3.3	34.9	8.6						

Table 21 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
September 1980											
Chironomidae larvae			27.7								
Chironomidae pupae		35.7	24.2								
Argulus		48.7	15.9								
Ephemeroptera			14.3								
Miscellaneous		15.6	17.9								
October 1980											
Chironomidae larvae			11.3	1.9			9.1	12.2			
Chironomidae pupae		16.7	34.4	46.8			16.2	12.5			
Chaoborus larvae				5.0							
Ostracoda			4.5	2.5							
Argulus			15.5	11.1							
Copepoda		66.7	4.7								
Clupeidae			1.9	2.9	25.0		25.9	29.3			
Unidentified fish				1.9	25.0		14.7	12.9			
Ephemeroptera			4.4	2.1							
Hymenoptera			15.2	19.9		95.6	8.9	19.4			
Miscellaneous		16.6	8.1	5.9	50.0	4.4	25.2	13.7			
November 1980											
Chironomidae larvae			85.7								
Chironomidae pupae								50.0			
Miscellaneous			14.3					50.0			
December 1980											
Chironomidae larvae								4.5			
Chironomidae pupae								10.8			
Chaoborus larvae							13.3	17.1			
Clupeidae							46.7	39.9	53.3	100.0	

Table 21 (Continued)

Month-Year Food Organisms	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
December 1980 (cont.)											
Unidentified fish					50.0		10.0	20.0	16.7		
Miscellaneous					50.0		30.0	7.7	30.0		
January 1981											
Chironomidae larvae					32.2						
Clupeidae								33.3	18.3		
Miscellaneous					67.8				31.7		
Empty							100.0	66.7	50.0	100.0	

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX F

Table 22. Striped Bass Electivity Indices--Items Selected For or Preferred by Length Class and Month.

Month-Year Preferred Food	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1979											
Chironomidae pupae		+	+								
Chaoborus larvae			+								
Copepoda	+										
Hydracarina			+								
August 1979											
Chironomidae pupae		+		+							
September 1979											
Chironomidae larvae			+	+							
Chironomidae pupae			+								
October 1979											
Chironomidae pupae		+									
Chaoborus larvae			+								
Copepoda			+								
November 1979											
Clupeidae*											+
December 1979											
Clupeidae*											+
March 1980											
Chironomidae larvae								+			
Chironomidae pupae								+			
Clupeidae								+			
April 1980											
Chaoborus larvae				+							
Chironomidae larvae				+							
Chironomidae pupae				+							
Cladocera				+	+						
June 1980											
Copepoda					+						
Clupeidae								+			
Morone chrysops											+
August 1980											
Clupeidae										+	+

*Originally stocked in June 1978.

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX G

Table 23. Hybrid Bass Electivity Indices--Items Selected For or Preferred by Length Class and Month.

Month-Year Preferred Food	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
July 1980											
Chironomidae pupae			+	+	+	+					
Chaoborus larvae			+	+	+						
Ostracoda			+								
Copepoda		+	+								
Clupeidae			+	+	+	+					
Ephemeroptera			+								
August 1980											
Chironomidae pupae			+	+	+	+					
Argulus				+							
Clupeidae						+	+				
Larval fish					+						
Ephemeroptera			+	+							
September 1980											
Chironomidae pupae				+							
Argulus				+							
Ephemeroptera				+							
October 1980											
Chironomidae pupae			+	+	+			+	+		
Chaoborus larvae					+						
Ostracoda				+							
Argulus				+	+						
Copepoda			+								
Clupeidae					+	+		+	+		
Unidentified fish								+	+		
Ephemeroptera				+	+						
Hymenoptera pupae				+	+		+	+	+		
November 1980											
Chironomidae pupae									+		
December 1980											
Chironomidae pupae									+		
Chaoborus larvae								+	+		
Clupeidae								+	+	+	+
Unidentified fish						+		+	+	+	

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX H

Table 24. White Bass Electivity Indices--Items Selected For or Preferred by Length Class and Month.

Month-Year Preferred Food	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1979											
Chironomidae pupae		+	+	+	+						
Chaoborus larvae		+	+	+							
Clupeidae				+							
Larval fish			+								
Unidentified fish				+	+						
August 1979											
Chironomidae pupae		+	+	+							
Clupeidae				+	+	+					
Morone chrysops					+	+					
Unidentified fish			+	+	+		+				
September 1979											
Chironomidae larvae		+	+	+			+				
Chironomidae pupae		+	+	+		+					
Argulus						+					
Clupeidae					+	+					
Unidentified fish					+		+				
Neuroptera larvae				+							
October 1979											
Chaoborus larvae			+								
November 1979											
Chironomidae larvae						+					
Chironomidae pupae						+					
Clupeidae					+	+					
December 1979											
Chironomidae pupae					+						
Clupeidae						+					
Morone chrysops						+					
Unidentified fish							+				
February 1980											
Chironomidae pupae								+			
March 1980											
Chironomidae larvae					+			+	+		+
Clupeidae					+			+			
Unidentified fish							+				
April 1980											
Chironomidae pupae			+	+	+	+	+	+			
Chaoborus larvae				+	+	+	+				
Cladocera			+	+	+	+					

Table 24 (Continued)

Month-Year Preferred Food	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
April 1980 (cont.)											
Clupeidae							+	+			
Unidentified fish							+				
May 1980											
Chironomidae pupae								+			
Chironomidae larvae									+		
Clupeidae								+	+		+
July 1980											
Chironomidae pupae		+	+	+							
Chaoborus larvae		+									
Copepoda	+										
Clupeidae		+	+	+							
Centrarchidae	+		+								
Morone chrysops			+								
Larval fish		+	+								
August 1980											
Chironomidae pupae			+	+	+	+					
Chaoborus larvae		+									
Argulus		+									
Copepoda	+										
Clupeidae			+	+	+	+		+	+		
Centrarchidae											
Morone chrysops					+						
Larval fish			+								
Unidentified fish				+	+						
Ephemeroptera		+		+							
Hymenoptera pupae			+								
September 1980											
Chironomidae pupae			+	+		+					
Chaoborus larvae		+									
Argulus			+								
Clupeidae					+	+					
Centrarchidae							+				
Ictalurus punctatus						+					
Larval fish			+								
Unidentified fish						+					
Hymenoptera pupae		+	+	+		+					
October 1980											
Chironomidae pupae		+	+	+	+	+	+				
Chaoborus larvae		+	+								
Copepoda		+	+								
Clupeidae						+	+				
Unidentified fish				+			+				
Hymenoptera pupae			+		+	+					

Table 24 (Continued)

Month-Year Preferred Food	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
November 1980											
Chironomidae pupae						+	+				
Clupeidae						+	+				
Unidentified fish						+					
December 1980											
Chironomidae pupae				+			+	+			
Unidentified fish							+				
Clupeidae						+	+	+			+

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX I

Table 25. Striped Bass Electivity Indices--Items Selected Against or Not Preferred by Length Class and Month.

Month-Year Food Selected Against	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1979											
Chironomidae larvae	-										
Chironomidae pupae	-										
Cladocera	-	-	-								
Copepoda		-	-								
August 1979											
Cladocera		-	-								
Copepoda		-	-								
September 1979											
Chaoborus larvae				-							
Cladocera			-								
Copepoda			-	-							
October 1979											
Chironomidae larvae			-								
Chironomidae pupae			-								
Cladocera		-	-								
Copepoda		-									
November 1979											
Cladocera											-
Copepoda											-
December 1979											
Chironomidae larvae											-
Cladocera											-
Copepoda											-
February 1980											
Cladocera						-					
Copepoda						-					
March 1980											
Cladocera								-			
Copepoda								-			
April 1980											
Chironomidae larvae					-						
Copepoda				-	-						
June 1980											
Chironomidae larvae					-			-			-
Chironomidae pupae					-			-			-
Cladocera								-			-
Copepoda								-			-

Table 25 (Continued)

Month-Year Food Selected Against	Length Class[a]										
	1	2	3	4	5	6	7	8	9	10	11
August 1980											
Chironomidae larvae										-	-
Chironomidae pupae										-	-
Chaoborus larvae										-	-
Cladocera										-	-
Copepoda										-	
Morone chrysops											-

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX J

Table 26. Hybrid Bass Electivity Indices--Items Selected Against or Not Preferred by Length Class and Month.

Month-Year Food Selected Against	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1980											
Chironomidae larvae			-	-	-						
Cladocera	-	-	-	-	-						
Copepoda				-	-						
August 1980											
Chironomidae larvae				-	-	-					
Chironomidae pupae						-					
Chaoborus larvae		-	-	-	-	-					
Cladocera		-	-	-	-	-					
Copepoda		-		-	-	-					
September 1980											
Chaoborus larvae		-	-								
Cladocera		-	-								
Copepoda		-	-								
October 1980											
Chironomidae larvae		-	-	-	-	-	-	-			
Chaoborus larvae					-						
Cladocera		-	-	-	-	-	-	-			
Copepoda					-						
November 1980											
Chironomidae larvae								-			
December 1980											
Chironomidae larvae					-		-	-	-	-	
Cladocera					-		-	-	-	-	
Copepoda					-		-	-	-	-	

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX K

Table 27. White Bass Electivity Indices--Items Selected Against or Not Preferred by Length Class and Month.

Month-Year Food Selected Against	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1979											
Cladocera		-	-	-	-						
Copepoda			-	-	-						
August 1979											
Cladocera		-	-	-	-	-	-				
Copepoda		-	-	-	-	-	-				
September 1979											
Chaoborus larvae			-	-	-	-	-				
Cladocera		-	-	-	-	-	-				
Copepoda		-			-	-	-				
October 1979											
Cladocera		-	-								
Copepoda		-									
November 1979											
Cladocera					-	-					
Copepoda					-	-					
December 1979											
Chironomidae larvae					-	-	-				
Cladocera					-	-	-				
Copepoda					-	-	-				
February 1980											
Cladocera								-			
Copepoda								-			
March 1980											
Ostracoda					-			-			-
Cladocera					-		-	-	-		-
Copepoda					-		-	-	-		-
April 1980											
Chironomidae larvae			-	-	-						
Cladocera							-	-			
Copepoda				-	-	-	-	-			
May 1980											
Chironomidae larvae								-			-
Cladocera								-	-		-
Copepoda								-	-		-

Table 27 (Continued)

Month-Year Food Selected Against	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1980											
Chironomidae larvae			-	-							
Cladocera	-	-	-	-							
Copepoda				-							
August 1980											
Chironomidae larvae					-	-		-	-		
Chironomidae pupae	-							-	-		
Chaoborus larvae	-			-	-	-		-	-		
Cladocera	-	-	-	-	-	-		-	-		
Copepoda			-	-	-	-		-	-		
September 1980											
Chironomidae larvae		-	-	-	-	-					
Chaoborus larvae				-	-	-	-				
Cladocera				-	-	-	-				
Copepoda		-		-	-	-	-				
October 1980											
Chironomidae larvae		-	-	-	-	-	-				
Cladocera			-	-	-	-	-				
November 1980											
Chironomidae larvae						-	-				
December 1980											
Chironomidae larvae				-		-	-	-			-
Cladocera				-		-	-	-			-
Copepoda				-		-	-	-			-

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX L

Table 28. Striped Bass Electivity Indices--Items Neutrally Selected by Length Class and Month.

Month-Year Neutrally Selected Food	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1979											
Chironomidae larvae		0	0								
August 1979											
Chironomidae larvae		0	0	0							
Chironomidae pupae			0								
September 1979											
Chironomidae larvae				0							
Chaoborus larvae			0								
Cladocera				0							
October 1979											
Chironomidae larvae		0									
February 1980											
Chironomidae larvae						0					
April 1980											
Chironomidae larvae				0							
June 1980											
Cladocera					0						

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX M

Table 29. Hybrid Bass Electivity Indices--Items Neutrally Selected by Length Class and Month.

Month-Year Neutrally Selected Food	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1980											
Chironomidae larvae	0	0									
Copepoda											
August 1980											
Chironomidae larvae		0	0								
Copepoda			0								
September 1980											
Chironomidae larvae		0	0								
November 1980											
Chironomidae larvae			0								

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

APPENDIX N

Table 30. White Bass Electivity Indices--Items Neutrally Selected by Length Class and Month.

Month-Year Neutrally Selected Food	Length Class[a] 1	2	3	4	5	6	7	8	9	10	11
July 1979											
Chironomidae larvae		0	0	0	0						
Copepoda		0									
August 1979											
Chironomidae larvae		0	0	0	0	0	0				
Chironomidae pupae						0	0				
September 1979											
Chironomidae larvae					0	0					
Chaoborus larvae		0									
Copepoda			0	0							
October 1979											
Chironomidae larvae		0	0								
Chironomidae pupae		0	0								
Copepoda			0								
February 1980											
Chironomidae larvae								0			
March 1980											
Ostracoda							0				
April 1980											
Chironomidae larvae						0	0	0			
Copepoda			0								
July 1980											
Chironomidae larvae	0	0									
Copepoda			0								
August 1980											
Chironomidae larvae	0	0	0	0							
Chironomidae pupae		0									
Chaoborus larvae		0	0								
September 1980											
Chironomidae larvae							0				
Chaoborus larvae			0								
Cladocera		0									
October 1980											
Cladocera		0									

[a]Length Classes are as follows: 1 = 2.6-5.0 cm, 2 = 5.1-7.5 cm, 3 = 7.6-10.0 cm, 4 = 10.1-12.5 cm, 5 = 12.6-15.0 cm, 6 = 15.1-17.5 cm, 7 = 17.6-20.0 cm, 8 = 20.1-22.5 cm, 9 = 22.6-25.0 cm, 10 = 25.1-27.5 cm, 11 = 27.6 cm and above.

VITA

Bruce Michael Saul was born in Augusta, Georgia on February 15, 1954. He attended elementary schools in that city and graduated from Augusta Preparatory School in June 1972. In June 1978, he received his Bachelor of Science degree from Augusta College, Augusta, Georgia. In August 1981, he received his Master of Science degree from The University of Tennessee, Knoxville.

Bruce was married to the former Debra K. Jones of Augusta, Georgia on May 26, 1979.