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

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Abstract: Of 80,000 hybrid striped bass *(Morone chrysops* × *Morone saxatilis)* stocked in June 1980 in Cherokee Reservoir, Tennessee, only 206 were recaptured. They were stocked at a mean total length of 4.5 cm and averaged 21.5 cm after 7 months of growth. After stocking, hybrids consumed mostly Crustacea, with Chironomidae being the primary food source in fish 5.0 to 12.0 cm in length. Fish first appeared in the diet when hybrids were 5.0 cm and became more abundant as the hybrids grew larger. Condition values (K) for hybrids ranged from 0.9 to 1.2.

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Since the late 1950's striped bass *(Morone saxatilis)* introductions have become an integral part of many state fish and game programs. Due to difficulties in obtaining brood fish, propagation of fry, and subsequent survival in many eutrophic lakes, the white bass *(Morone chrysops)* male × striped bass female hybrid (hereafter known as the hybrid) has become a substitute or supplement to striped bass stocking programs.

Since the original cross by Stevens (1965), hybrid propagation has been increasingly successful in terms of survival and expense. Hybrids show faster growth than striped bass until they are 2 to 2½ years old (Bishop 1967). Hybrids are also easier to catch and are a more desirable sport fish for many fishermen (Ware 1974). Hybrids require less time at the hatchery and can be successfully stocked as fry, yielding excellent fisheries (Cottrell, TWRA, personal communication). Hybrids have been shown to prefer shad over other available forage, thus enhancing their use as a management tool (Bishop 1967, Williams 1970, Ware 1974, and Crandall 1978).

Hybrids have been stocked in East Tennessee since 1965 (Bishop 1967) with fisheries being established in Cherokee and Watts Bar Reservoirs. A limited fishery exists in Norris Reservoir although stocking has been curtailed in past years.

The purpose of this investigation was to analyze the diet of young-of-year hybrids to determine its composition and at what point fish became an important part of the diet. In addition, growth of hybrids was determined for the duration of the study.

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METHODS

Cherokee Reservoir is located on the main stem of the Holston River in East Tennessee. This multipurpose storage impoundment was formed in 1941 by the Tennessee Valley Authority (TVA). At full pool, this reservoir covers 12,591 ha with a maximum depth of 46 m. Cherokee Reservoir is used primarily for hydroelectric power generation, flood control, and recreation.

On 23 June 1980, 80,000 hybrids from Tennessee Wildlife Resources Agency's Eagle Bend Hatchery were stocked at County Line Access ramp in the upper end of Cherokee Reservoir. Prestocking samples of zooplankton, fish, and substrate organisms revealed this area was rich in food items and low in predators. Poststocking collections of hybrids began on 15 July 1980 and areas were sampled up to 8 km on either side of the stocking site. Fish were collected every 2 weeks with a 9.5 mm × 1.8 m × 15.2 m straight seine on each collection date at 5 to 8 sites per night until November 1980. Monthly samples began in November 1980 and continued through January 1981. From August 1980 through January 1981 fish were also collected with gill nets 45.7 m long by 1.8 m deep with mesh sizes of approximately 13, 19, 25, and 32 mm. Electrofishing was also utilized on most collection dates (at night) with a boom-type 230-V (5000 watt) high cycle AC generating unit. Sampling was continued on each collection date until no hybrids were collected. This required a collection at one site beyond the last site at which hybrids were captured. All specimens were preserved in 10% formalin for later analysis.

Gut analyses were performed on hybrids collected (the gut included the entire digestive tract from the esophagus to the anus). Food items were identified under a 40× binocular dissecting scope.

Numerical abundance of foods (by actual numbers consumed) and frequency of occurrence of foods were tabulated for hybrids by collection site and length class. Coefficients of condition were determined using Hile (1936) where

$$K = \frac{100\ W}{L^3},$$

with weight in grams and total length in centimeters.

RESULTS AND DISCUSSION

Food Habits

Food habits of 206 hybrids collected from July 1980 through January 1981 were analyzed. Of this number, 9 (4.4%) were empty. Young-of-year hybrids ate more Chironomidae than any other food organisms. By numerical abundance, hybrid diets consisted of 34% Chironomidae, 17% Crustacea, and 16% fish (Table 1). Chironomidae occurred in 34% of stomachs with food Crustacea in 18%, and fishes in 14% (Table 1).

When food habits were examined by collection sites at monthly intervals, Chironomidae were again ingested more frequently. In July and August 1980, hybrids not only consumed Chironomidae at most sites, but also Ephemeroptera

Table 1. Food items in the guts of hybrids by percent of total numbers consumed and by frequency of occurrence in all samples.

Food organisms	Percent of total	Frequency of occurrence (%)
Chironomidae larvae	16.0	14.7
Chironomidae pupae	18.1	17.8
Chaoborus larvae	7.7	6.2
Ostracoda	3.7	1.3
Cladocera	1.6	0.6
Argulus sp.	3.7	3.0
Copepoda	8.8	10.2
Clupeidae	10.3	13.3
Centrarchidae	0.4	0.3
Notropis sp.	0.1	0.1
Larval fish	0.7	0.5
Unidentified fish	2.8	2.2
Ephemeroptera	3.5	4.5
Hymenoptera pupae	1.6	3.5
Miscellaneous	19.4	17.4
Empty	1.6	4.4

(mainly *Siphlonurus* sp.), Crustacea, and fish (mainly Clupeidae). It was noted that small fish were usually consumed when they were present. In September and October 1980, hybrid food habits shifted to the copepod *Argulus* sp. While Chironomidae were an important food source during this period, this shift in diet toward *Argulus* sp. and fish at some sites, indicated a selection for larger food items. Hybrids consumed a large number of fish, especially Culpeidae, from October 1980 through January 1981.

Hybrids were grouped into 2.5-cm length classes and food habits of different length fish were determined (Table 2). Fish appeared in hybrid diets in the 5.1 to 7.5 cm length class and became increasingly important as the hybrids grew longer. Consumption of fish more than doubled in the 12.6 to 15.0 cm group and remained relatively constant for larger length classes. Hymenoptera pupae (most likely terrestrial forms), in addition to fish, appeared important to 15.1 to 17.5 cm length classes probably because of their presence in large numbers at the collection site. Hybrid diets showed a reduction in Chironomidae numbers as hybrid lengths increased. Crustacea were only important to smaller length classes of fish. Studies by Bishop (1967), Williams (1970), Ware (1974), and Crandall (1978) revealed that Clupeidae were preferred food for hybrids.

Growth

Hybrids were stocked in June 1980 at a mean total length of 4.5 cm ($n = 30$); seven months later these fish ($n = 19$) averaged 21.5 cm total length (Fig. 1). This

was similar to Bishop's (1976) value of 21.3 cm for 7-month-old hybrids in Cherokee Reservoir. He also found that hybrids could reach 35.8 cm in 1 year. This value was higher than Crandall's (1978) estimate of 30.3 to 35.1 cm hybrids in Lake Bastrop, Texas, and lower than Williams' (1970) 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 1 year in Florida. Based on 7 months of data, hybrids in Cherokee Reservoir grew to length comparable to those attained by fish in past years (Bishop, TWRA, personal communication). This growth was considered near optimal for hybrids in Cherokee Reservoir.

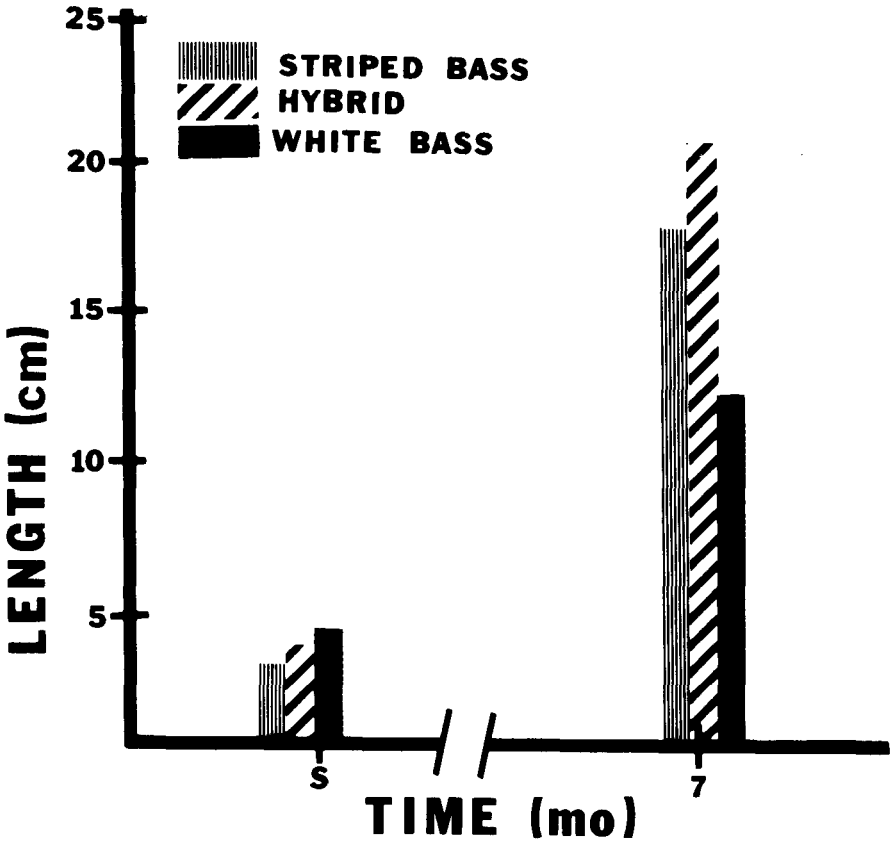

Fig. 1. Mean growth of hybrids after 7 months compared to growth of white and striped bass.

Hybrids in this study had condition values (K) of 0.9 to 1.2 (Table 3); these values were similar to those determined for Lake Bastrop, Texas, hybrids (Crandall 1978) of 1.1 to 1.4. The differences in these values were probably due to larger fish measured over a longer period of time in the Lake Bastrop study. The high

Table 2. Hybrid bass food consumption (% of total) by length classes.

Food Organisms	Length Classes (cm) 2.6-5.0	5.1-7.5	7.6-10.0	10.1-12.5	12.6-15.0	15.1-17.5	17.6-20.0	20.1-22.5	22.6-25.0	25.1-27.5
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

Table 3. Condition factors (K) of hybrids by 2.5 cm length classes.

Total length (cm)	Sample Size (Number)	K
2.6 - 5.0	2	1.11
5.1 - 7.5	62	0.89
7.6 - 10.0	57	0.86
10.1 - 12.5	23	0.89
12.6 - 15.0	9	0.96
15.1 - 17.5	2	1.16
17.6 - 20.0	17	1.08
20.1 - 22.5	17	1.06
22.6 - 25.0	15	1.15
25.1 - 27.5	2	1.06

initial K value of 1.1 in Cherokee Reservoir fish was probably due to a small sample size (n = 2) and their plumpness at stocking. The 21% increase in condition between 12.5 to 15.0 and 15.1 to 17.5 cm length class was probably due to increased utilization of larger prey.

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