FOOD HABITS OF ADULT STRIPED BASS FROM KEYSTONE RESERVOIR AND ITS TAILWATERS

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Abstract: During 1974, 1975 and 1976, stomachs of 467 adult striped bass (*Morone saxatilis*) from Keystone Reservoir and its tailwaters were collected and examined for content. Gizzard shad (*Dorosoma cepedianum*) was the most abundant food item found in striped bass stomachs. The relationship between the length of striped bass and the length of gizzard shad consumed was not significant (.05%). Seasonal and habitat variations in the diet were not significant (.05%).

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Previous stomach content studies of adult striped bass have primarily dealt with marine populations. Widespread introducltion of striped bass in inland bodies of water have raised questions about the food requirements of the species in reservoirs and streams. Previous studies of the food habits of adult striped bass from freshwater populations have been reported by Stevens (1958, 1964), Domrose (1963), Goodson (1964), Neal (1967) and Ware (1974). The objective of the present study was to determine the food habits of adult striped bass in a large warmwater reservoir and its tailwaters.

Keystone Reservoir, a 10,648-ha flood control and hydroelectric impoundment on the Arkansas River, was impounded in 1965. Striped bass fingerlings were introduced into the reservoir from 1965-1969 (Mensinger 1970), and natural reproduction has occurred each year since 1969 (K. E. Erickson, personal communication, Oklahoma Dept. Wildl. Cons.).

MATERIALS AND METHODS

From March 1974 through February 1976, stomachs of 303 adult striped bass were collected from Keystone Reservoir and stomachs of 164 from the tailwaters. Monthly samples were collected from Keystone Reservoir by over night sets of gill and trammel nets (0.05 x 2.4 x 91 m, 0.76 x 2.4 x 91 m, and 0.10 x 2.4 x 91 m), while samples from the tailwaters were collected from fish caught by anglers.

Stomachs were removed immediately, wrapped in cheesecloth and preserved in 10% formalin. Contents were later examined and all food items identified, counted, and recorded. During the 1975-76 sampling period, the total lengths of all gizzard shad removed from striped bass stomachs were recorded. The volume of food items was determined by water displacement (Lagler 1956).

Stomach contents were analyzed and statistical comparisons were made between habitat (reservoir and tailwaters) and seasons of the year. In addition, regression analysis was made between the fork lengths of striped bass and the total lengths of the gizzard shad they consumed.

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RESULTS AND DISCUSSION

Of the 303 stomachs examined from Keystone Reservoir, 196 (64.7%) contained food items; 106 (64.6%) of the 164 stomachs collected from Keystone Tailwaters contained food items (Table 1). Fish and fish remains were the only food itms found in the

stomachs of striped bass from the reservoir while 6 fish species and 1 crustacean were found in striped bass from the tailwaters (Table 2). The predominent food item of adult striped bass in both Keystone Reservoir and its tailwaters was gizzard shad. It occurred in 77.0% of the samples and made up 83.4% of the stomach contents by volume in the reservoir. In the tailwaters the respective values were almost identical for occurrence and volume (79.2% and 84.6%). Other fish species found in striped bass stomachs (Table 2) were Mississippi silverside (*Menida audens*), freshwater drum (*Aplodinotus grunniens*), bluegill (*Lepomis macrochirus*), white crappie (*Pomoxis annularis*), white bass (*Morone chrysops*), and minnows (*Notropis* spp.).

Table 1. Seasonal[a] percentages of striped bass stomachs containing food in collections taken from Keystone Reservoir and tailwater, 1974-76.

Location and Season	*No. of Stomachs Examined*	*Percentage With Food*
Reservoir		
Spring	55	70.9
Summer	39	25.6
Fall	52	53.8
Winter	157	75.8
Total	303	64.7
Tailwaters		
Spring	79	49.4
Summer	7	42.9
Fall	37	67.6
Winter	41	95.1
Total	164	64.6

[a]Spring = March - May; summer = June - August; fall = September - November; winter = December - February

Table 2. Frequency of occurrence and percentage of total volume of food items from stomachs of adult striped bass from Keystone Reservoir and tailwater.

	Frequency of Occurrence		*Volume*	
Food Item	*Reservoir*	*Tailwater*	*Reservoir*	*Tailwater*
Pisces				
Dorosoma cepedianum	77.0	79.2	83.4	84.6
Menidia audens	13.8	2.8	8.2	0.1
Aplodinotus grunniens	1.5	15.0	3.3	4.6
Pomoxis annularis	3.6	10.4	3.3	5.8
Lepomis macrochirus	0.5	---	0.3	---
Morone chrysops	---	0.9	---	3.0
Notropis sp.	2.0	2.8	0.2	0.2
Unidentified fish remains	11.7	13.2	1.3	1.4
Crustacea				
Orconectes sp.	---	1.9	---	0.4

Game fish found in stomach contents from the reservoir were restricted to white crappie, while in the tailwaters striped bass consumed minor amounts of both white crappie and white bass. Neal (1967), Domrose (1963) and Stevens (1958, 1964) also found white crappie remains in striped bass stomachs, but each author concluded that white crappie were of minor importance.

The stomach contents of striped bass in this study were similar to those reported for other freshwater populations of striped bass. Domrose (1963), Stevens (1958, 1964), Neal (1967), and Ware (1974) also found that gizzard shad was the principal forage fish consumed by striped bass. Game fish, other forage fish and crayfish comprised a small portion of the stomach contents of striped bass in the present study. This study supports the conclusions of Stevens (1958) and Ware (1974) that striped bass are not significant predators on game fish populations in warmwater reservoirs and their tailwaters.

Stomach contents of striped bass from the 2 habitats (reservoir and tailwater) varied slightly during the study period. The frequency of occurrence and percentage volume of each species consumed by striped bass from the tailwater habitat were not significantly different (ANOVA; $P > 0.05$) from these values for fish consumed by striped bass in the reservoir.

Seasonal differences in the number and volume of each forage species consumed by striped bass in both the reservoir and tailwaters were not significant ($P > 0.05$). Gizzard shad dominated the stomach contents collected during all seasons in both habitats (Table 3). Other species of minor importance in the reservoir populations were Mississippi silversides in the fall and winter seasons and drum and white crappie during summer. Although of minor importance, white crappie constituted more of the tailwater stomach contents by occurrence and volume during more seasons than the reservoir samples. Freshwater drum was also of minor importance in the tailwater stomachs during the spring. Similarly, Stevens (1958) found clupeids to be the predominant food of striped bass during all seasons except spring, when mayfly nymphs were most abundant in the stomach contents.

Table 3. Seasonal[a] percentages of occurrence and volume of food items from stomachs of adult striped bass from Keystone Reservoir and tailwater.

	Season and (in parenthesis) number of stomachs with food							
	Spring (78)		*Summer* (13)		*Fall* (53)		*Winter* (158)	
Food Item	*Occurrence*	*Volume*	*Occurrence*	*Volume*	*Occurrence*	*Volume*	*Occurrence*	*Volume*
Reservoir								
Dorosoma cepedianum	79.5	91.5	70.0	62.1	89.3	96.1	74.0	80.6
Menidia audens	---	---	---	---	17.9	2.2	18.5	12.8
Aplodinotus grunniens	---	---	10.0	15.5	---	---	1.7	3.7
Pomoxis annularis	7.7	3.7	10.0	22.2	3.6	0.7	1.7	1.8
Lepomis macrochirus	2.6	1.7	---	---	---	---	---	---
Notropis sp.	2.6	0.2	---	---	10.7	0.8	---	---
Unidentified fish remains	15.4	3.4	10.0	0.2	3.6	0.3	12.6	1.1
Tailwater								
Dorosoma cepdianum	61.5	66.6	33.3	52.9	88.0	85.0	94.9	90.3
Menidia audens	---	---	---	---	---	---	7.7	0.3
Aplodinotus grunniens	33.3	24.6	---	---	8.0	1.9	2.6	0.2
Pomoxis annularis	7.7	5.0	33.3	29.4	20.0	11.3	5.1	1.2
Morone chrysops	---	---	---	---	---	---	2.6	6.6
Notropis sp.	---	---	---	---	8.0	0.3	5.1	0.3
Unidentified fish remains	20.5	3.8	33.3	17.7	8.0	1.5	7.7	0.4
Orconectes sp.	---	---	---	---	---	---	5.1	0.8

[a]Spring - March - May; summer - June - August; fall - September - November; winter - December - February.

Gizzard shad found in striped bass 483 to 711 mm in length were 25 to 241 mm long (mode, 76 mm). In South Carolina, Stevens (1958) found that striped bass 754 mm in length consumed gizzard shad up to 384 mm long. A trend was noted toward an increase in the mean length of gizzard shad consumed with an increase in the mean length of striped bass. Statistical differences in the relation between the length of striped bass and the lengths of gizzard shad was not significant ($P > 0.05$, $F = 1.53$, $df = 9/236$). However, mean lengths of gizzard shad and striped bass length groups (25-mm groups) were positively correlated ($r = 0.78$). Regression analysis of this relationship was found highly significant ($P < 0.01$) between the mean lengths of gizzard shad consumed and the striped bass length groups (Fig. 1). In both Keystone Reservoir and its tailwaters, striped bass have the potential of reducing total numbers of gizzard shad, particularly those that may otherwise grow too large to be utilized as forage by most sport fishes.

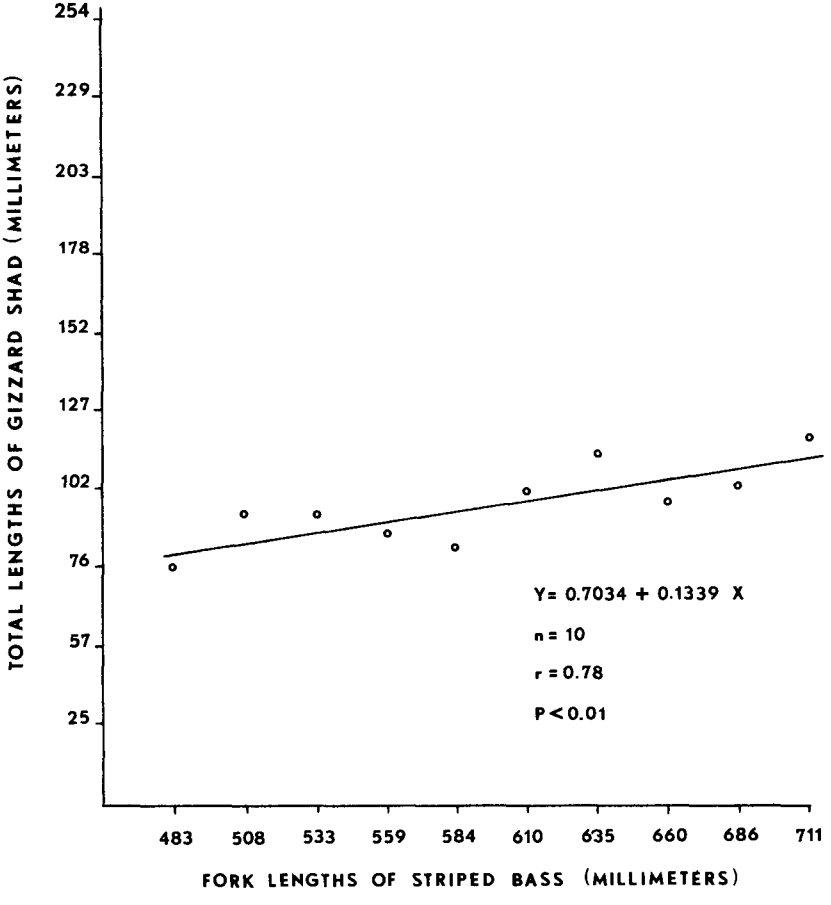

Fig. 1. The relationship of the mean total lengths of gizzard shad consumed by striped bass length groups.

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