FOOD HABITS OF YOUNG-OF-THE-YEAR STRIPED BASS, *ROCCUS SAXATILIS* (WALBAUM), IN CANTON RESERVOIR[1]

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On June 16, 1969, 56,000 hatchery-reared, fingerling, striped bass, *Roccus saxatilis* (Walbaum), averaging 50 mm total-length, were introduced into Canton Reservoir. This study was conducted as a part of an expanded effort to determine the ecology of these striped bass and to define the effect of their introduction upon the existing fish population of Canton Reservoir.

METHODS AND MATERIALS

Shoreline seining proved to be the most efficient method of collecting the young-of-the-year striped bass. A 40 ft by 4 ft bag seine of ¼ inch mesh with a cheese cloth liner was used at 6 stations. A sample consisted of all fish taken with two seine hauls, each covering 80 ft of shoreline, at each station. Samples were taken weekly from June 20, 1969 until August 28, 1969, then biweekly until October 23, 1969. The sampling schedule, which was derived from the latin-square design utilizing six stations and six time periods, was modified from recommendations made by Gennings (1). Sample periods were spaced at 1½ hr intervals between 8:00 a.m. and 3:30 p.m.

Fish from each sample were immediately preserved in 10% formalin, and the time, date, station, and weather conditions were recorded. Samples were taken to the laboratory where the striped bass were sorted, measured, and placed in individual, numbered vials for temporary storage.

A total of 346 striped bass was collected during the 14 weeks of sampling. Stomach analyses were conducted on 117 individuals and only 18 (15.4%) of these stomachs were found to be empty. All calculations and measurements were made on the 99 stomachs which contained food.

Stomachs were removed intact by first cutting away the entire body wall on the left side. An incision was made along the entire length of the stomach and the contents were flushed into a petri dish. Food items were sorted and identified. Individuals within each class of food organisms were counted and their total volume was determined. When numerous small organisms were encountered in a stomach, they were sub-sampled by counting the individuals in one-fourth of a gridded petri dish. An effort was made to insure that the organisms were distributed as evenly as possible in the dish. Determinations of the volumes of various food items in each stomach were made by the water displacement method, using graduated centrifuge tubes. However, with the smaller fish it was occasionally necessary to estimate the volume of food items because of obvious errors in the displacement method.

The percentage of total volume, percentage of total number, and percentage (frequency) of occurrence methods of food habits data analysis were used in this study. For the sake of simplicity, food organisms have been classified in five groups: 1) Crustacea; 2) Insecta; 3) Arachnida; 4) Pisces; 5) miscellaneous (plant material, sand grains, fish scales, and unidentified organic matter).

RESULTS AND DISCUSSION

Table 1 summarizes total catch by dates of collection and the number of stomachs examined each week. Data on weekly average total-lengths of striped bass are also included. Results of analyses of the total number and volume, as well as the frequency of occurrence, of food organisms eaten by striped bass are presented in Tables 2, 3, and 4.

Although several investigators have studied the food habits of the striped bass, their studies have been concerned, for the most part, with adults. Harper et al. (2)

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TABLE 1. *Summary of sample dates and numbers of striped bass collected and examined, Canton Reservoir, June-October, 1969.*

Date collected	Number collected	Number examined	Mean total-length (mm)
Jun 20	23	10	53
Jun 26	59	10	58
Jul 2	79	9	66
Jul 11	30	10	72
Jul 24	29	11	78
Aug 1	62	10	77
Aug 8	10	10	79
Aug 14	12	10	81
Aug 21	10	10	83
Aug 28	6	6	85
Sep 10	7	4	91
Sep 26	3	3	94
Oct 9	12	10	100
Oct 23	4	4	97
TOTAL	346	117	

conducted a food habits study of young-of-the-year striped bass in hatchery ponds. That study revealed that young striped bass, 10 to 30 mm standard-length, fed predominantly on copepods and that fish longer than 30 mm exhibited a marked preference for cladocerans. Fish first appeared in stomachs when the striped bass measured 60 mm standard-length, but did not become an important food item until the bass had attained 100 mm in standard-length. A similar situation concerning the use of crustaceans as food was found for the young striped bass in Canton. The average total-length at the time of introduction was 50 mm, and crustaceans were a very significant part of the diet during the weeks immediately after introduction. However, the importance of crustaceans as a food item decreased steadily as the season progressed. Amphipods and cladocerans were the most common crustaceans in the later samples.

The decrease in abundance of crustaceans in striped bass stomachs was reflected similarly in the relative abundance of crustaceans in meter net samples collected in Canton Reservoir between May and July. Preliminary observations of these samples indicate that crustaceans, especially cladocerans and copepods, composed nearly 100% of the volume of the May samples, but represented only approximately 10% of the sample volume in mid-July. The relationship between the occurrence of crustaceans in the stomachs of striped bass and the abundance of these organisms in the environment was noted in a similar study conducted by Heubach et al. (3).

During this same period, insects became increasingly important and accounted for 60% of the diet. Large numbers of culicid and chironomid larvae and pupae were eaten, but Ephemeroptera, Trichoptera, Hymenoptera, Odonata, and Orthoptera were found in lesser numbers. Observation of mid-July meter net samples indicates that larval and pupal dipterans occupied approximately 80% of the sample volume and larval fish contributed another 10% to that volume.

Larval gizzard shad were the first fish encountered in the striped bass stomachs. These were taken in the June 26 sample. By July 2, larval gizzard shad represented 15% of the diet by both numbers and volume. Although no fish were found in any of the stomachs collected during August, they accounted for 49% of the food by volume and occurred in 16% of the stomachs examined from the four samples taken between September 10 and October 3.

Only 16 of the 99 striped bass stomachs contained fish. The forage fish were identified as: clupeids, 38%; cyprinids, 19%; centrarchids, 12%; atherinids, 6%; unidentified fish remains, 25%. Heubach et al. (3) concluded that fish were an unimportant food item for young-of-the-year striped bass. This was also indicated by the Canton data.

By the rather large variety of food items found in the stomachs, it was apparent that young-of-the-year striped bass fed opportunistically. No evidence of selectiveness for any particular species of forage was noted. It was interesting that no annelid worms were found in the stomachs and it appears that the young-of-the-year striped bass in Canton Reservoir obtained most of their food from open-water rather than bottom sources.

TABLE 2. *Percentage of total volume of food organisms eaten by stripped bass.*

Organisms	Week 1	2	3	4	5	6	7	8	9	10	12	14	16	18
CRUSTACEA														
Copepoda	4.4	16.5	17.0	—	11.8	3.5	14.3	—	0.4	—	—	—	—	5.3
Malacostraca	12.6	6.0	1.4	6.0	—	17.8	1.1	—	—	—	—	—	0.2	—
Branchiopoda	—	—	—	15.0	—	4.3	1.1	—	12.1	—	—	—	—	28.0
Branchiura	4.4	—	—	—	—	0.4	—	—	—	—	1.0	—	—	33.3
Unidentified	10.6	2.5	2.2	1.0	—	—	0.3	—	—	—	—	—	—	—
Total Crustacea	32.0	25.0	20.6	22.0	11.8	26.0	26.8	—	12.5	—	1.0	—	0.2	66.6
INSECTA														
Aquatic														
Diptera	31.2	16.9	50.7	15.9	65.2	46.4	54.9	26.7	43.0	5.0	—	—	44.3	—
Ephemeroptera	2.6	0.5	6.4	33.5	—	—	9.3	—	—	—	—	—	—	—
Odonata	—	—	—	10.0	—	—	—	—	—	—	—	—	—	—
Trichoptera	—	—	—	—	—	0.6	—	—	—	—	—	—	—	—
Terrestrial														
Orthoptera	—	—	—	—	—	—	3.8	—	—	—	—	—	—	—
Hymenoptera	—	—	—	0.1	—	—	—	—	—	—	—	50.0	—	—
Unidentified	0.2	8.0	0.7	2.5	—	—	—	—	—	—	—	—	10.0	—
Total Insecta	34.0	25.4	57.8	62.0	65.2	47.0	68.0	26.7	43.0	5.0	—	50.0	54.3	—
ARRCHNIDA														
Acarina	—	—	0.2	—	—	—	0.2	—	—	—	—	—	—	—
Aranea	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—
Total Arachnida	—	—	0.4	—	—	—	0.2	—	—	—	—	—	—	—
PISCES														
Clupeidae	—	7.5	15.0	10.0	10.9	—	—	—	—	—	24.0	—	9.5	—
Cyprinidae	—	—	—	—	—	—	—	—	—	—	50.0	—	6.0	—
Centrarchidae	—	—	—	—	10.6	—	—	—	—	—	—	50.0	—	—
Atherinidae	—	—	—	—	—	—	—	—	—	—	—	—	4.0	—
Unidentified	—	—	—	—	—	—	—	—	—	—	25.0	—	—	28.3
Total Pisces	—	7.5	15.0	10.0	21.5	—	—	—	—	—	99.0	50.0	19.5	28.3
MISCELLANEOUS														
Unidentified organic matter	34.0	42.1	6.2	6.0	1.5	27.0	15.0	73.3	44.5	95.0	—	—	26.0	5.1

TABLE 3. *Percentage of total number of food organisms eaten by striped bass.*

Organisms	Week													
	1	2	3	4	5	6	7	8	9	10	12	14	16	18
CRUSTACEA														
Copepoda	10.3	42.4	27.6	—	20.0	4.3	23.4	—	0.6	—	—	—	—	3.6
Malacostraca	4.9	11.4	0.1	2.6	—	16.8	1.2	—	—	—	—	—	0.2	—
Branchiopoda	—	—	—	21.4	—	20.4	1.5	—	19.4	—	—	—	—	29.7
Branchiura	8.0	—	—	—	—	0.4	—	—	—	—	12.5	—	—	33.3
Unidentified	10.3	—	2.6	—	—	—	—	—	—	—	—	—	—	—
Total Crustacea	33.5	53.8	30.3	24.0	20.0	41.7	26.1	—	20.0	—	12.5	—	0.2	66.6
INSECTA														
Aquatic														
Diptera	62.0	30.2	42.1	26.0	68.9	58.2	71.8	66.6	80.0	50.0	—	—	76.8	—
Ephemeroptera	4.4	1.4	—	26.2	—	—	2.1	—	—	—	—	—	—	—
Odonata	—	—	—	10.0	—	—	—	—	—	—	—	—	—	—
Trichoptera	—	—	—	—	—	0.1	—	—	—	—	—	—	—	—
Terrestrial														
Orthoptera	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hymenoptera	—	—	—	1.3	—	—	—	—	—	—	—	50.0	—	—
Unidentified	—	14.3	4.8	2.5	—	—	—	—	—	—	—	—	11.1	—
Total Insecta	66.4	45.9	46.9	66.0	68.9	58.3	73.9	66.6	80.0	50.0	—	50.0	87.9	—
ARACHNIDA														
Acarina	—	—	7.1	—	—	—	—	—	—	—	—	—	—	—
Aranea	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—
Total Arachnida	—	—	7.2	—	—	—	—	—	—	—	—	—	—	—
PISCES														
Clupeidae	—	0.1	15.4	10.0	5.6	—	—	—	—	—	12.5	—	1.0	—
Cyprinidae	—	—	—	—	—	—	—	—	—	—	50.0	—	5.6	—
Centrarchidae	—	—	—	—	5.6	—	—	—	—	—	—	50.0	—	—
Atherinidae	—	—	—	—	—	—	—	—	—	—	—	—	5.6	—
Unidentified	—	—	—	—	—	—	—	—	—	—	25.0	—	—	33.3
Total Pisces	—	0.1	15.4	10.0	11.2	—	—	—	—	—	87.5	50.0	12.2	33.3
MISCELLANEOUS														
Unidentified organic matter	—	0.2	—	—	—	—	—	33.3	—	50.0	—	—	—	—

TABLE 4. *Percentage of occurrence of food organisms in 99 striped bass stomachs.*

Organisms	%	Description
CRUSTACEA		
Copepoda	15.2	*Diaptomus* and *Cyclops spp.*
Malacostraca	12.1	Amphipods and isopods
Branchiopoda	9.0	Cladocera: *Diaphanosoma* and *Daphnia spp.*
Branchiura	4.0	*Argulus spp.*
Unidentified	6.1	
Total Crustacea	46.5	
INSECTA		
Diptera	60.6	*Chaoborus* and *Chironomus spp.*
Ephemeroptera	10.1	Mayflies*
Hymenoptera	2.0	Ants*
Odonata	1.0	Damsel flies*
Trichoptera	1.0	Caddis flies*
Orthoptera	1.0	Grasshoppers*
Unidentified	4.0	
Total Crustacea	79.7	
ARACHNIDA		
Acarina	2.0	Watermites*
Aranea	1.0	Spiders*
Total Arachnida	3.0	
PISCES		
Clupeidae	6.1	*Dorosoma cepedianum*
Cyprinidae	3.0	*Hybognatus placitus, Pimephales vigilax* and *Notropis spp.*
Centrarchidae	2.0	*Micropterus salmoides* and *Lepomis spp.*
Atherinidae	1.0	*Labidesthes sicculus*
Unidentified	4.0	
Total Pisces	16.1	
MISCELLANEOUS		
Unidentified organic matter	52.5	

* Species not identified.

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