

Diet Overlap in Redbreast and Longear Sunfishes from Small Streams of East Central Alabama

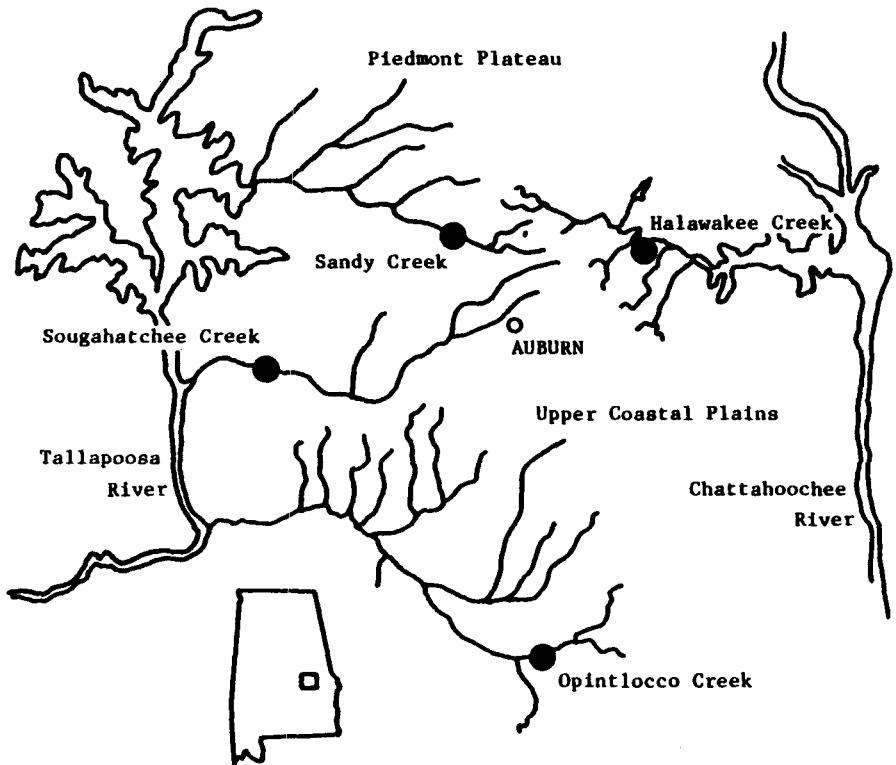
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Abstract: A food habit study was conducted for the redbreast sunfish (*Lepomis auritus*) and the longear sunfish (*Lepomis megalotis*) occurring in small streams of the Coastal Plains and Piedmont Plateau physiographic provinces near Auburn, Alabama. Fish stomach analyses revealed that redbreast and longear are primarily insectivores. The bulk of the diet of both species in small streams was composed of aquatic and terrestrial insects. Crustaceans were also consumed by both species regularly. Ingestion of a wide variety of other organisms suggests opportunistic feeding in both species. Based on 24-hour sampling results, both species had the greatest food item diversity during daylight hours and the least after dark. Redbreast was the more active feeder. Significant overlap in food habits between the 2 species was evident using the Schoener Index to food overlap. Food habits of the 2 species appear similar enough to influence the distribution of these fishes in streams above and below the Fall Line. However, the situation merits additional study.

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According to Smith-Vaniz (1968), the distribution of the longear (*Lepomis megalotis*) and redbreast (*Lepomis auritus*) sunfishes was not affected by the Fall Line in Alabama. Records of the Auburn University Ichthyological Museum indicate that the fishes have been collected together above the Fall Line in Halawakee and Sougahatchee Creeks, Lee County, Alabama on several occasions. Both species have been collected both above and below the Fall Line. However, recent surveys by various researchers at Auburn University have revealed an absence of longear above the Fall Line and redbreast below the Fall Line in the vicinity of Auburn, Alabama (Bayne and Hill 1981). More specifically, in fish samples taken from Sandy, Sougahatchee



and Halawakee Creeks located in the Piedmont Plateau physiographic province, no longear were collected though numerous redbreast were collected. During sampling of Opintlocco Creek in the Coastal Plains physiographic province, numerous longear were collected but no redbreast. These creeks were sampled during 1979 and 1980 utilizing both rotenone and electrofishing sampling techniques (Bayne and Hill 1981).

The food habits of the redbreast sunfish in streams of the southeastern United States have been studied (McLane 1955, Wayatt et al. 1967, Phillips 1967, Davis 1972, Bass and Hitt 1974, Sandow et al. 1974 and Coomer et al. 1977). Less information is available on stream dwelling longear sunfish (Minckley 1963 and Mancini et al. 1979). Although no comparison of the diets of the 2 species has been attempted it appears from published studies that both are opportunistic insectivores and may depend upon a common food source. During low flow periods, in second and third order streams, this shared dependence could lead to competition that would influence the distribution of the 2 fishes. The objective of our study was to determine, through an investigation of the food habits of the 2 species, whether significant diet

overlap occurs. We thank John S. Ramsey and Richard K. Wallace, Jr. for their assistance in the design of the study, and John S. Ramsey for his review of the manuscript.

Methods

Description of the Study Area

All sampling for redbreast and longear was conducted in 1979–1980. The 3 streams selected for seasonal sampling were Sougahatchee, Opintlocco and Sandy Creeks, all within the Tallapoosa River drainage. Halawakee Creek, part of the Apalachicola River drainage system, was sampled only during the summer of 1980. Sougahatchee, Sandy and Halawakee Creeks lie in the Piedmont Plateau physiographic province in Chambers and Lee Counties, Alabama. Opintlocco Creek lies in the Coastal Plains physiographic province in Macon County, Alabama. Areas sampled were located on second order streams at Opintlocco and Sandy Creeks and on third order portions of Sougahatchee and Halawakee Creeks.

Sampling Techniques

Fish were collected with a Smith-Root battery powered backpack electroshocker and immediately put on ice to prevent regurgitation (Doxtater 1963). After transportation to the laboratory they were measured to the nearest millimeter (total length), weighed to the nearest gram, and preserved in 10% formalin. Stomachs and intestines were then dissected from the fish and placed in vials in 40% isopropyl alcohol. The stomach contents were examined under a dissecting microscope and identified to the lowest taxonomic level possible. All food items of a like taxonomic category, e.g. Chironomidae, were counted and their volume measured by distributing those items evenly on an enumeration grid (Ricker 1971).

During the summer of 1980, fish were collected in Sougahatchee and Opintlocco Creeks at 4-hour intervals, for a time not exceeding 30 minutes, over a 24-hour period to determine variations in daily feeding activity. Collection and examination procedures as described above were utilized for all fish collected during these periods.

Analysis of Food Habits

Raw data for the entire sampling period were analyzed for intraspecific differences in diet as suggested by Mathur (1977), since it was thought that food items chosen by larger individuals would differ from those taken by

smaller individuals. After examining the accumulated data, it was decided to analyze those fish ≤ 100 mm independently from those ≥ 101 mm for each species.

Stomach contents of each species were tabulated by (1) the percentage of all stomachs (containing food) in which each food category occurred (percentage or frequency of occurrence), (2) the percentage that each food category contributed to the total number of food items in all stomachs (percentage of total number), (3) the percentage that each food category contributed to the total volume of food in all stomachs (percentage of total volume), and (4) the average percentage that each food category contributed to the total volume of food in each stomach (mean of the volume percentages).

Hurlbert (1978) reported that the Schoener (1970) index is the best estimator of diet overlap between 2 species when food resource availability is unknown. The index gives values from 0 (no overlap) to 1.0 (complete overlap) with significant overlap defined as those values > 0.60 .

The equation for the Schoener Index is:

$$\alpha = 1.0 - 0.5 \sum_{i=1}^n |P_{xi} - P_{yi}|$$

where α is the overlap index, P_{xi} is the proportion of food category i in the diet of species x , P_{yi} is the proportion of food category i in the diet of species y , and n is the number of food categories.

Wallace (1981) reported that the mean of the volume percentages appeared to be the most appropriate diet measure for use in overlap indices in most situations. This measure alleviates the main criticism of the percentage of total volume measure, i.e., the over-emphasis of stomach contents of a few individuals at the expense of the overall population diet. For this reason the mean of the volume percentages was utilized in the Schoener Index. The overlap index was used to detect food habit similarity between redbreast occurring in different streams and in comparing similarity between redbreast and longear in different streams.

Results and Discussion

Food Habits and Feeding Behavior

Two hundred thirty-nine redbreast ranging in total length from 50 to 192 mm and 184 longear ranging in total length from 50 to 153 mm were collected during the period fall 1979 through summer 1980.

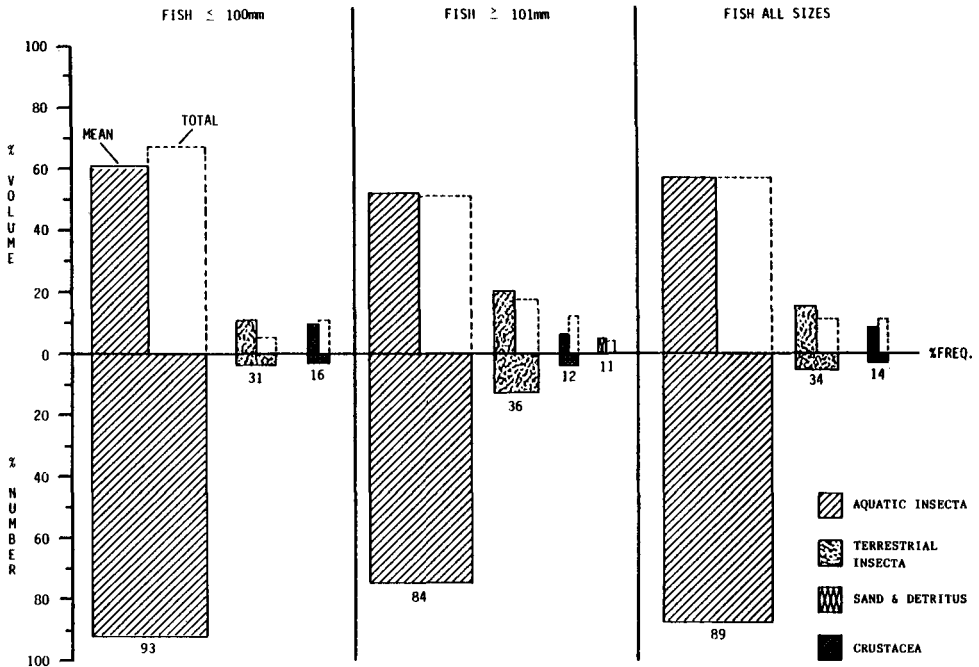


Figure 1. Percentage composition of *Lepomis megalotis* stomach contents by major categories collected from Opintlocco Creek in the spring of 1980.

The longear and redbreast sunfishes were primarily insectivores relying heavily on mayflies, chironomids, caddisflies and adult and larval aquatic beetles. Smaller fish (≤ 100 mm) of both species consumed proportionally greater quantities of aquatic insects by number and volume while larger fish (≥ 101 mm) consumed greater quantities of terrestrial insects and other food items (Fig. 1 and 2). Crustaceans, including crayfish, were regularly consumed by both species. McLane (1955) and Bass and Hitt (1974) described the redbreast as an opportunistic insectivore feeding upon larvae, nymphs and emergent aquatic insects, adult terrestrial insects, crustaceans and other aquatic organisms. Carlander (1977) described the longear diet as consisting primarily of aquatic insects, terrestrial insects and crayfish. In addition to the above mentioned items, it was noted from stomachs examined that both species ingested a wide variety of other organisms, including mollusks, fish, fish eggs, arachnids, annelids, and on 1 occasion a redbreast stomach contained a short-tailed shrew. These observations suggest opportunistic feeding in both species. Plant matter and detritus were also found quite often in stomachs although it is not known whether this material was ingested purposely or incidentally. Detailed data on food habits are reported by Cooner (1981).

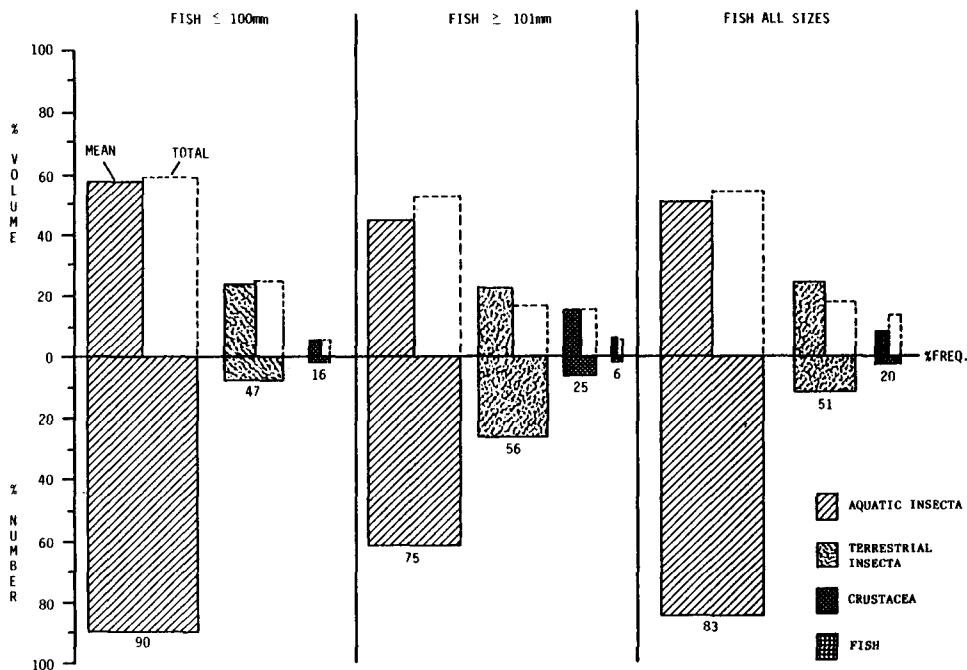


Figure 2. Percentage composition of *Lepomis auritus* stomach contents by major categories collected from Sandy Creek in the spring of 1980.

Based on 24-hour sampling results, both species had the greatest food item diversity during daylight hours and the least after dark. Although both species continued to feed 24 hours a day, redbreast appeared to be more active than longear during darkness as stomachs from redbreast during this time contained greater food item numbers and volume.

Diet Overlap

Food of redbreast collected from one stream was compared to that of redbreast from a different stream to assess diet similarity. The categories used to compute the Schoener overlap index (Schoener 1970) from stomach analyses were: aquatic insects, terrestrial insects, crustaceans, mollusks, annelids, arachnids, fish, fish eggs, plant material, sand and detritus, and other. Overlap did exist in both size groups of redbreast from different streams collected in the spring and summer seasons (Table 1). The exception (overlap of < 0.60) was in a comparison of the diets of redbreast collected in summer from Sougahatchee and Sandy creeks. This discrepancy was probably due to the inadequate number of stomachs examined from Sandy Creek which gave inaccurate food habit results. The highest overlap came from a comparison

Table 1. Diet Overlap of *Lepomis auritus* and *Lepomis megalotis* Utilizing Schoener Overlap Index

<i>Lepomis auritus</i> compared to <i>Lepomis auritus</i>		Season (1980)		≤ 100 mm		≥ 101 mm		All Sizes	
				Index	No. Fish	Index	No. Fish	Index	No. Fish
Souhatchee Creek x Sandy Creek	spring	0.66	8 x 20	0.78	32 x 16	0.78	40 x 36	0.78	40 x 36
Souhatchee Creek x Halawakee Creek	summer	0.76	24 x 26	0.61	59 x 22	0.70	83 x 48	0.70	83 x 48
Souhatchee Creek x Sandy Creek	summer	—	—	—	—	0.43 ^a	83 x 12	0.43 ^a	83 x 12
Halawakee Creek x Sandy Creek	summer	—	—	—	—	0.65	48 x 12	0.65	48 x 12
<i>Lepomis auritus</i> compared to <i>Lepomis megalotis</i>		Season (1980)		≤ 100 mm		≥ 101 mm		All Sizes	
		Index	No. Fish	Index	No. Fish	Index	No. Fish	Index	No. Fish
Souhatchee Creek x Opintlocco Creek	spring	0.70	8 x 54	0.91	32 x 49	0.86	40 x 103	0.86	40 x 103
Sandy Creek x Opintlocco Creek	spring	0.85	20 x 54	0.84	16 x 49	0.87	36 x 103	0.87	36 x 103
Souhatchee Creek x Opintlocco Creek	summer	0.82	24 x 24	0.64	59 x 29	0.77	83 x 53	0.77	83 x 53
Halawakee Creek x Opintlocco Creek	summer	0.74	26 x 24	0.70	22 x 29	0.77	48 x 53	0.77	48 x 53
Sandy Creek x Opintlocco Creek	summer	—	—	—	—	0.49 ^a	12 x 53	0.49 ^a	12 x 53

^a Overlap < 0.60; considered not significant

of redbreast collected in the spring from Sougahatchee and Sandy Creeks. The fish had 8 of 11 food categories in common and redbreast from Sandy utilized 10 categories while fish from Sougahatchee utilized 9 (Table 1).

When comparing food habits of longear to redbreast, diet overlap was significant between the species during spring and summer seasons in both size groups with 1 exception. The dietary overlap between longear from Opintlocco and redbreast from Sandy Creek collected during the summer was not found to be significant. The small sample size from Sandy Creek during this quarter is, again, the probable explanation for this.

The highest and lowest values of overlap were found in a comparison of the 2 species in the same size group in the same streams during different seasons. An overlap value of 0.91 occurred between longear \cong 101 mm from Opintlocco to redbreast \cong 101 mm from Sougahatchee collected during the spring. The 2 species had 9 of the 11 food categories in common. The longear consumed 11 different food types while the redbreast ingested 9. An overlap value of 0.64, still considered significant, was found in a comparison of the same size groups of fishes in the same streams during the summer. The 2 species had only 5 of the 11 categories in common. The redbreast used 9 food types as in the spring but the longear used only 7. In the summer longear did not consume annelids, fish eggs or arachnids and reduced its consumption of aquatic insects.

When longear and redbreast occur separately in similar types of streams there is a significant similarity in diet of these 2 fishes. Additional study is needed to conclusively determine if food competition is a factor limiting distribution of the 2 species. Studies that include food resource availability are needed.

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