CONCLUSIONS

These experiments, although limited, have demonstrated that yellow bass, under certain environmental conditions, are capable of living, growing, and reproducing in farm ponds. Additional information on productivity, population control, long term survival and fishing success will be needed, however, before a satisfactory evaluation of the species can be made. The initial results would probably justify further experimentation.

LITERATURE CITED

DiCostanzo, Charles. 1954. Clear Lake Angling, 1953. Iowa Conservationist, Vol. 13, No. 6, June, pp. 43.

Kutkuhn, Joseph H. 1954. Mid-Summer Fishing at North Twin. Iowa Conservationist, Vol. 13, No. 6, June, pp. 41, 44.

———————. 1955. Food and Feeding Habits of Some Fishes in a Dredged Iowa Lake. Proc. of the Iowa Acad. of Sci., Vol. 62, December 15, pp. 576-588.

Reelfoot Lake, Tennessee for 1939 and 1955. Jour. of the Tenn. Acad. of

Schoffman, Robert J. 1956. Age and Rate of Growth of the Yellow Bass in Sci., Vol. 31, No. 1, January, pp. 20-25.

FOOD HABITS OF THREE CENTRARCHIDAE IN LAKE GEORGE, FLORIDA

By MELVIN T. HUISH

Florida Game and Fresh Water Fish Commission
Fisheries Experiment Station
Leesburg, Florida

ABSTRACT

An investigation of the stomach contents of bluegill, black crappie, and redear sunfish was made from specimens collected during several months of 1948, 1949, and 1950, in Lake George, Florida. Major items found in stomachs of 432 large bluegills were: aquatic vegetation, crustacea, insecta, and fish eggs. Fifty-five stomachs from small bluegills contained, principally, Cladocera and Diptera larvae. *Dorosoma petenensis vanhyningi* (Weed) was the major food organism found in 145 black crappie. An analysis of 69 redear sunfish stomachs showed snails (*Amnicola* sp.) were the dominant food of this species.

INTRODUCTION

Concurrent with other biological investigations conducted on Lake George, examinations of stomach contents of bluegill, *Lepomis macrochirus purpurescens* (Cope), black crappie, *Pomoxis nigromaculatus* (LeSueur), and redear sunfish, *Lepomis microlophus microlophus* (Gunther) were made. There are no previously published food habit studies of these species for Lake George.

This investigation of food habits of three species was begun December, 1948 and concluded in October, 1950. Bluegill, black crappie, and redear sunfish were selected because of their importance as game fish, as is the largemouth black bass, *Micropterus salmoides floridanus* (LeSueur). The food habits of this species from the Lake George area were described by McLane (1948). In addition these species exist in such abundance their food habits are important when considering inter-specific relationships.

Lake George, one of several wide places in the St. Johns River, covers an area 73.5 square miles and has an average depth of 10 feet. The bottom is composed principally of sand, mud, and shell. Vegetation, primarily *Vallisneria americana* and *Naias guadalupensis*, occurs in varying abundance around its shores and bars.

COLLECTING METHODS AND PROCEDURE

The major collecting method of fish examined was by commercial haul seine. The seines were approximately 1,600 yards in length and consisted of a 1,500-

yard wing, 100-yard footing circle, and a bag. Minimum stretched mesh of the nets was three inches. The time elapsed from laying out of the seines to removing of fish from the bag was from four to six hours. Freshness of many food items in stomachs indicated the fish fed until their final concentration in the footing circle. A few specimens of bluegill and redear were found gilled in the footing circle and bag. These two species did not seem to be disturbed by the operations until they were nearly completed. However, black crappie were sometimes found gilled in the wing of the net. Since commercial seine collections included only fish of approximately six inches and over, they were supplemented by collections from a 20-foot shrimp trawl with a 1-inch stretched mesh. The trawl was towed behind a boat for five- to ten-minute periods and then taken up.

Field analyses were made of stomach contents of some fish. Some fish and stomachs were preserved in 10 percent formalin and taken to the Welaka laboratory for analysis. Items were sorted and counted. When the number was large as with fish eggs a portion was counted and used as a basis for calculating total estimated numbers. Total volume was determined by water displacement, or volume was estimated in terms of cubic centimeters by observation, using as a basis previous displacement determinations of similar items.

FOOD HABITS OF THE EASTERN BLUEGILL

Numerous food habit studies of the western bluegill, *Lepomis macrochirus macrochirus* have been made. However, the eastern bluegill, *Lepomis macrochirus purpurescens,* has received very little attention. Chable (1947) observed this subspecies to be less particular in its selection of food than the western bluegill. His study showed several differences between the food of young bluegills in lentic and lotic situations and concluded the differences were due to food availability rather than selection. Crustacea were important in both situations. However, insects formed a major portion of the bulk of the food in both environments with chironomid larvae predominating.

Food habits of adult eastern bluegill, as indicated by Chable's study, were similar in lotic and lentic environments. In both cases *Hyalella azteca* was most frequently taken. Diptera larvae, caddis larvae, and adult beetles made up the bulk of the diet in lentic environments as compared to the diet of Diptera larvae, Ephemeroptera nymphs, adult beetles and Odonata nymphs in streams. Fish eggs only made an appearance during early spring according to his study. He concluded plant matter, which occurred in fifty percent of the stomachs in lentic habitats, was undigested in the intestines and appeared to be unimportant.

The 487 bluegill examined during this study were placed in two categories: those under four inches in total length were classified as "small," those over four inches were considered as "large." The seasonal food of 432 large bluegills is summarized in Table I. The column headed "Frequency of Occurrence" lists percentage of stomachs with food containing the particular item. "Number of Items" is the number of that item in the stomachs examined. "Percentage of Total Volume" indicated that percentage of estimated volume of all foods occupied by the volume of that item.

TABLE I

THE SEASONAL FOOD OF LARGE BLUEGILL FROM LAKE GEORGE, FLORIDA
NOVEMBER, 1948 THROUGH OCTOBER, 1950

Date	*November, 1948*			*December, 1948*		
Organisms Eaten	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*
Algae	4	..	1.1	..	..	..
Vallisneria	..	..	..	32	..	33.2
Hyacinth roots	..	..	..	10	..	3.6
Plant debris	53	..	27.7	34	..	34.5
Nematoda	..	..	..	..	..	..
Oligochaeta	..	..	..	2	1	0.4
Cladocera (Unidentified)	..	..	..	..	..	..
Amphipoda	16	63	7.1	44	168	11.1
Mysidacea	..	..	..	..	..	..
Callinectes	..	..	..	..	..	..
Rhithropanopeus	..	..	..	..	..	..
Palaemonetes	12	3	4.9	6	4	3.7
Neuroptera Nymphs	..	..	..	..	..	..
Ephemerida Nymphs	..	..	..	..	..	..
Zygoptera Nymphs	..	..	..	..	..	..
Corixidae Adults	..	..	..	..	..	..
Haliplidae Adults	8	7	3.3	..	..	..
Dystiscidae Larvae	..	..	..	2	2	0.4
Coleoptera Adults (Terrestrial)	..	..	..	..	..	..
Coleoptera Larvae	..	..	..	..	..	..
Trichoptera Larvae and Cases	24	14	7.1	10	8	2.1
Chironomid Larvae	28	139	14.4	20	20	3.4
Chironomid Pupae	..	..	..	2	2	0.4
Chironomid Adults	..	..	..	2	1	0.4
Chironomid Pupal Skins	..	..	..	..	..	..
Chironomid Tube Remains	..	..	..	..	..	..
Diptera Larvae, Large White	..	..	..	4	6	0.8
Diptera Larvae, Small Green	..	..	..	..	..	..
Insect Remains	4	..	1.4	..	..	..
Fish	..	..	..	2	1	0.4
Fish Eggs	..	..	..	..	..	..
Fish Scales	..	..	..	10	30	4.5
Animal Remains	..	..	..	..	..	..
Bottom Debris	44	..	33.1	8	..	3.1
Empty		17			16	
Total No. Stomachs Examined		42			66	
Size Range—Total Length (")		5.4–10.2			5.8–9.5	
Average Volume of Food		0.4 cc			0.4 cc	
Volume of Food in All Fishes		18.4 cc			23.4 cc	

TABLE I—*Continued*

THE SEASONAL FOOD OF LARGE BLUEGILL FROM LAKE GEORGE, FLORIDA
NOVEMBER, 1948 THROUGH OCTOBER, 1950

Date	*April, 1950*			*July, 1950*		
Organisms Eaten	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*
Algae	..	..	..	..	..	..
Vallisneria	..	..	..	..	..	..
Hyacinth Roots	40	..	45.3	23	..	27.9
Plant Debris	13	..	6.5	..	..	..
Nematoda	2	1	Tr.*	..	..	..
Oligochaeta	10	78	1.3	1	1	0.1
Cladocera (Unidentified)	42	706	8.7	20	91	1.7
Amphipoda	3	4	0.2	7	59	1.7
Mysidacea	..	..	..	6	9	0.2
Callinectes	..	..	..	..	..	..
Rhithropanopeus	..	..	..	..	..	..
Palaemonetes	3	2	0.2	..	..	..
Neuroptera Nymphs	..	..	..	1	1	0.1
Ephemerida Nymphs	2	1	0.1	1	1	0.1
Zygoptera Nymphs	..	..	..	..	..	..
Corixidae Adults	..	..	..	3	2	0.2
Haliplidae Adults	..	..	..	..	..	..
Dystiscidae Larvae	..	..	..	..	..	..
Coleoptera Adults (Terrestrial)	..	..	..	..	..	..
Coleoptera Larvae	2	1	Tr.	..	..	..
Trichoptera Larvae and Cases	2	1	Tr.	7	15	0.5
Chironomid Larvae	20	70	3.7	4	12	0.4
Chironomid Pupae	..	..	..	1	1	Tr.
Chironomid Adults	..	..	..	..	..	..
Chironomid Pupal Skins	2	3	0.3	..	..	..
Chironomid Tube Remains	2	1	0.2	3	..	1.5
Diptera Larvae, Large White	5	3	Tr.	27	54	1.5
Diptera Larvae, Small Green	..	..	..	31	1,474	5.8
Insect Remains	3	..	0.4	..	..	..
Fish	..	..	..	..	..	..
Fish Eggs	39	9,283	17.1	163	9,230	15.6
Fish Scales	2	2	0.3	..	..	..
Animal Remains	16	..	2.5	..	..	..
Bottom Debris	30	..	7.6	72	..	36.1
Empty		5			5	
Total No. Stomachs Examined		67			75	
Size Range—Total Length (")		4.0–8.8			4.0–8.1	
Average Volume of Food		0.5 cc			0.5 cc	
Volume of Food in All Fishes		34.7 cc			54.9 cc	

* Materials less than 0.1 cc by volume are recorded as trace.

TABLE I—*Continued*

THE SEASONAL FOOD OF LARGE BLUEGILL FROM LAKE GEORGE, FLORIDA NOVEMBER, 1948 THROUGH OCTOBER, 1950

Date	*August, 1950*			*October, 1950*		
Organisms Eaten	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*
Algae	..	..	..	..	..	..
Vallisneria	..	..	..	12	..	5.5
Hyacinth Roots	..	..	..	9		3.7
Plant Debris	..	..	..	22	..	9.0
Nematoda	..	..	..	..	..	..
Oligochaeta	1	1	Tr.*	..	..	..
Cladocera (Unidentified)	..	..	..	11	43	1.3
Amphipoda	1	1	Tr.	21	57	4.4
Mysidacea	..	..	..	2	2	Tr.
Callinectes	..	..	..	1	..	0.6
Rhithropanopeus	1	1	0.4	7	7	4.0
Palaemonetes	2	2	0.5	1	2	0.1
Neuroptera Nymphs	..	..	..	7	61	3.6
Ephemerida Nymphs	..	..	..	1	2	0.2
Zygoptera Nymphs	..	..	..	2	2	4.6
Corixidae Adults	..	..	..	..	..	..
Haliplidae Adults	..	..	..	..	..	..
Dystiscidae Larvae	..	..	..	..	..	..
Coleoptera Adults (Terrestrial)	2	2	0.1	..	..	..
Coleoptera Larvae	2	2	0.4	..	..	..
Trichoptera Larvae and Cases	18	35	1.4	40	165	9.0
Chironomid Larvae	95	3,387	85.0	81	886	34.7
Chironomid Pupae	11	27	0.9	6	6	0.2
Chironomid Adults	6	31	0.7	..	..	..
Chironomid Pupal Skins	1	10	Tr.	10	24	0.6
Chironomid Tube Remains	6	..	4.4	1	..	0.6
Diptera Larvae, Large White	..	..	..	1	1	Tr.
Diptera Larvae, Small Green	..	..	..	..	..	..
Insect Remains	..	..	..	..	..	..
Fish	..	..	..	..	..	..
Fish Eggs	..	..	..	5	35	0.2
Fish Scales	..	..	..	..	..	..
Animal Remains	1	..	0.5	..	..	..
Bottom Debris	25	..	4.8	59	..	20.4
Empty		7			1	
Total No. Stomachs Examined		101			81	
Size Range—Total Length (")		4.0–10.0			5.3–8.8	
Average Volume of Food		0.5 cc			0.4 cc	
Volume of Food in All Fishes		54.9 cc			30.2 cc	

* Materials less than 0.1 cc by volume are recorded as trace.

Major groups of food items eaten by large bluegill were: aquatic vegetation, Crustacea, Insecta, and fish eggs. Vegetation found in Lake George bluegill stomachs consisted of fragments of *Vallisneria americana,* hyacinth roots, and unidentified plant debris. Volumetrically, this material comprised a large percentage of the materials found in large bluegills. The amount varied according to kind of vegetation found and month of study. None was found in August, 1950.

The most abundant crustaceans were Cladocera. No attempt was made to further identify these organisms, although *Daphnia* sp. were recognized among them. Amounts of Cladocera varied during the months of study, being 8.7 percent of the total volume of food in April, 1950, and much less to none in other months. Two genera of Amphipoda were identified from stomach contents: *Hyalella* and *Gammarus.* Of these, *Hyalella* was the most abundant Amphipoda were found in all months collections were made and varied from 11.1 percent in December of 1948 to a trace in August, 1950. Seven graspsoid crabs (*Rhithropanopeus harrisii*) were found in stomachs examined in October. They constituted four percent of total volume for that month. One grapsord crab was also found in August. These were of small size and in some instances only fragments were found. Another crustacean, the fresh water shrimp (*Palaemonetes paludosa*), occurred in all months of study except July.

Of insects eaten, Chironomidae larvae were the most abundant. Frequency of occurrence ranged from four percent in July to 95 percent in August. Pupal and adult forms were also found, but in less abundance. These "blind mosquitoes" are noted in the area for periodic swarming over the lake. On occasion such great numbers were observed resting on the surface as to give an appearance of golden scum. Increase of ingested larvae from July to August (noted above) indicated they were more available to bluegills late in larval stages since nearly all found were large. Frequency of occurrence of Trichoptera larvae and cases ranged from 2 percent to 40 percent. An increase was indicated during July and August and a peak was reached in October during this study.

One bluegill was found to have eaten a fish which was approximately one-tenth cubic centimeter in volume and less than one inch in length. The species of fish to which the eggs belonged was not determined. However, large numbers of *Dorosoma petenensis vanhyningi* were in the lake during April. It is possible they were of this species.

Bottom debris consisted principally of sand and mud. This material, as well as plant debris, was probably obtained incidentally to the gathering of food from the bottom.

Table II summarizes food habits of small bluegill of Lake George. The 55 stomachs examined were taken from fish with a size range from 1.3 inches to 4.0 inches total length. These were collected by a 20-foot shrimp trawl from the same areas as those obtained during seining operations. Stomachs from fish taken in spring and summer were used. Crustacea comprised the major group of food organisms of the small fish. Cladocera were the most numerous of these. Their frequency of occurrence was particularly high in April when they were in 85 percent of stomachs containing food. Animal remains recorded during April consisted of partially digested Crustacea not counted or identified. The large amount of bottom debris in July was correlated with an increase in amount of Diptera larvae.

Comparison of foods of large bluegill and small bluegill during April and July indicated Cladocera were a more important item of food for small bluegill than for the larger. Fish eggs, a high percentage of occurrence in large fish, were absent from small fish stomachs. Diptera larvae (including chironomid larvae) seemed of equal importance to both large and small bluegill. They also fluctuated alike from month to month.

TABLE II

THE FOOD OF THE SMALL BLUEGILL FROM LAKE GEORGE, FLORIDA
APRIL AND JULY, 1950

Date	*April, 1950*			*July, 1950*		
Organisms Eaten	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*
Algae	..	..	..	5	..	1.4
Plant Debris	7	..	1.1	..	..	..
Nematoda	3	..	0.1	..	..	..
Crustacea (Unidentified)	3	100	0.4	..	..	..
Cladocera	85	601	37.4	35	148	8.5
Amphipoda	10	4	1.1	..	..	..
Mysidacea	7	2	1.3	10	15	14.2
Chironomid Larvae	17	7	3.7	..	..	..
Diptera Larvae, Large White	..	..	..	20	8	6.4
Diptera Larvae, Small Green	..	..	..	40	115	17.0
Animal Remains	67	..	50.5	..	..	..
Bottom Debris	7	..	2.7	70	..	51.8
Empty	3	..	..	2	..	..
Total No. Stomachs Examined	33	..	..	22	..	..
Size Range—Total Length (")		1.3–4.0			1.3–4.0	
Average Volume of Food		0.1 cc			0.1 cc	
Volume of Food in All Fish		5.0 cc			1.5 cc	

FOOD HABITS OF THE BLACK CRAPPIE

One hundred and forty black crappie stomach contents collected in July and August, 1949 and in July, 1950 were examined. The 1949 collection was obtained from commercial haul seines while the 1950 collection was supplemented by fish caught in a 20-foot trawl. The trawl collections contained more small fish.

Ninety-five fish examined in July and August, 1949, ranged from seven to fourteen inches long. Fourteen of the 95 stomachs examined were empty. Detailed analysis of stomach contents of the remaining 81 is presented (Table III).

TABLE III

THE FOOD OF THE BLACK CRAPPIE FROM LAKE GEORGE, FLORIDA
JULY AND AUGUST, 1949 AND JULY, 1950

Date	*July and August, 1949*			*July, 1950*		
Organisms Eaten	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*
Mollusca	1	2	Tr.	..	..	..
Cladocera	..	..	..	8	60	0.5
Mysidacea	..	..	..	60	475	23.0
Amphipoda	11	20	2.8	..	..	..
Palaemonetes	7	6	2.3	3	1	0.5
Anisoptera Nymphs	1	1	1.7	..	..	..
Coleoptera Larvae	2	2	0.1	..	..	..
Chironomidae Larvae	32	302	8.6	..	..	..
Chironomidae Pupae	51	1,952	29.0	..	..	..
Chironomidae Adults	6	58	1.0	..	..	..
Diptera Larvae	..	..	..	12	167	1.3
Diptera Pupae	..	..	..	5	6	0.3
Fish Remains	58	50	53.9	50	21	74.3

TABLE III—*Continued*

THE FOOD OF THE BLACK CRAPPIE FROM LAKE GEORGE, FLORIDA
JULY AND AUGUST, 1949 AND JULY, 1950

Date	*July and August, 1949*			*July, 1950*		
Organisms Eaten	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*	*Frequency of Occurrence*	*Number of Items*	*Percent of Total Volume*
Debris	..	..	..	3	..	0.1
Empty	14	..	..	5	..	..
Total No. Stomachs Examined	95	..	..	45	..	..
Size Range—Total Length (")		7.0–14.0			2.0–14.0	
Average Volume of Food		0.6 cc			0.4 cc	
Volume of Food in All Fish		59.8 cc			19.3 cc	

Two items of particular importance as food in 1949 were Chironomidae pupae (29 percent of total volume) and fish remains (54 percent of total volume). These items also occurred in the largest number of fish. Frequency of occurrence of fish remains was 58 percent, of chironomid pupae, 50 percent and of chironomid larvae, 32 percent. Fish remains identified were *Dorosoma petenensis vanhyningi.*

Forbes and Richardson (1920) found the most important items in the stomachs of 11 specimens to have been Entomostraca, fishes, and aquatic insects. Dendy (1946) observed in Norris Reservoir, Tennessee, that adult black crappie fed on aquatic insects during spring and early summer, but relied chiefly on young fish in late summer and fall. Young shad were the most important food fish. Reid (1950) reported black crappie of Orange Lake, Florida to have fed on fishes, and to a lesser extent, on Malacostraca, dipterous larvae, pupae and adults, and Entomostraca. Thirty-seven stream caught crappie containing food examined by Chable (1947) demonstrated that 54.05 percent fed on fish. *Gambusia affinis holbrookii* and *Notemigonus chrysoleucas bosci* were important food items of those identified. Chironomid larvae were the most important insect item. The remaining insect food consisted of Ephemeroptera nymphs, corixid nymphs, caddis larvae, Odonata nymphs, Coleoptera, Homoptera, and unidentified insects. Crustacea including *Palaemonetes paludosa* and *Mysidopsis* were present. He suggested regarding *Mysidopsis* "A more extensive study of the food habits of the speckled perch in the St. Johns River would likely prove this crustacean to be of considerable value as a food item."

During July, 1950, 45 stomachs were examined from crappie with a size range from 2 to 14 inches. The majority of these fish were taken from a 20-foot otter trawl. Of the 45 stomachs examined (Table III), five, or 11 percent of the total number, were empty. Twenty-three percent of the total volume of all food consisted of *Mysidopsis* sp. Although the volume of *Mysidopsis* was not as great as that of fish remains, the percent of fish containing this item was greater. Fish remains were composed principally of threadfin shad. No other species of food fish were identified.

The decrease in number of chironomid larvae consumed in July, 1950 from July, 1949, could have been caused by a seasonal difference in the life cycle of Chironomidae. In July, 1950, bluegill stomachs also contained only small quantities of chironomids.

When considered on the basis of one inch size groups a significant difference in foods of the fish existed during 1949 and 1950. Larger fish had a larger volume percent of fish remains while chironomid pupae occurred as a larger volume percent in small size groups in 1949. In 1950 chironomid pupae were replaced in importance by *Mysidopsis* (Table IV). Dendy (1946) found young crappie did not take fish until they reached a length of approximately 61 millimeters (2.4 inches) in length. Crappie 2.0-2.9 inches in length were found to have eaten fish at Lake George during this study.

TABLE IV

PERCENTAGE OF TOTAL VOLUME OF THE MAJOR FOOD ITEMS OF THE BLACK CRAPPIE (BY ONE-INCH SIZE GROUPS) FROM LAKE GEORGE, FLORIDA, JULY AND AUGUST, 1949 AND JULY, 1950

	July and August, 1949						
Total Length (Inches)	7.0–7.9	8.0–8.9	9.0–9.9	10.0–10.9	11.0–11.9	12.0–12.9	13.0–13.9
Fish Remains	21	49	53	84	81	71	0
Chironomid Pupae	44	38	32	4	16	3	0
Number of Fish	11	20	22	10	17	5	1

	July, 1950								
Total Length (")	2.0-2.9	3.0-3.9	4.0-4.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	12.0-12.9	13.0-13.9
Fish Remains	20	20	58	0	100	87	71	89	100
Mysidopsis sp.	73	75	37	0	0	13	26	11	0
Number of Fish	14	5	4	1	1	6	8	3	3

FOOD HABITS OF THE REDEAR SUNFISH

Chable (1947) found six redear sunfish from his lake collections to have fed on caddis larvae and Chironomidae larvae. Mollusca occurred in 66.67 percent of the stomachs. Stream collections indicated Mollusca occurred in 97.59 percent of those with food. *Goniobasis catenaria cancellata* (Say) occurred in 84.33 percent. Other snails were *Pomacea paludosa* (Say) and *Viviparus georgianus* (Lea). Crustaceans, insects, and plant matter formed a negligible share of the diet during the study.

Woods (unpublished in a study of food habits of the redear from Lakes Eustis and Harris during 1952 and 1953 found Mollusca, Chironomidae larvae and unidentified animal matter to be the dominant items at Lake Harris. Mollusca were of lesser importance in Lake Eustis.

In November and December, 1948, stomachs of 69 redear sunfish were examined from Lake George. Thirty-three stomachs were empty. Ninety-two percent of stomachs with food contained Mollusca. These comprised 74 percent of the total volume of ingesta. Nearly all the mollusca were small snails identified as *Amnicola* sp. Frequently only shell fragments were found (Table V).

TABLE V

THE FOOD OF THE REDEAR SUNFISH FROM LAKE GEORGE, FLORIDA NOVEMBER AND DECEMBER, 1948

Date	*November and December, 1948*		
Organisms Eaten	*Frequency of Occurrence*	*Number of Items*	*% of Total Volume*
Mollusca	92	..	74.4
Amphipoda	3	1	0.4
Chironomidae Larvae	8	19	5.1
Fish Scales	3	1	0.4
Animal Remains	3	..	1.6
Debris	8	..	18.1
Empty	33	..	..
Total Number of Stomachs Examined		69	
Size Range—Total Length (Inches)		7.0–10.9	
Average Volume of Food		0.2 cc	
Total Volume of Food		12.7 cc	

ACKNOWLEDGMENTS

Appreciation is extended to Dr. William McLane for aid in identifying organisms and for criticisms during manuscript preparation. Members of the Welaka personnel aided in recording data.

LITERATURE CITED

Chable, Alphonse C. 1947. A Study of the Food Habits and Ecological Relationships of the Sunfishes of Northern Florida. (Unpub. Master's Thesis, Univ. of Fla. Library.)

Dendy, Jack S. 1946. Food of Several Species of Fish, Norris Reservoir, Tennessee Jour. Tenn. Acad. Sci., 21, No. 1, pp. 105-127.

Forbes, A. A. and R. E. Richardson. 1920. The Fishes of Illinois. Nat. Hist. Surv., St. of Ill., 2nd Ed., pp. 240-259.

McLane, William M. 1948. The Seasonal Food of the Largemouth Black Bass, *Micropterus salmoides floridanus* (Lacepede), in the St. Johns River, Welaka, Florida. Quart. Jour. Fla. Acad. Sci., 10, No. 4, pp. 103-138.

Reid, George K., Jr. 1950. Food of the Black Crappie *Pomoxis nigromaculatus* (LeSueur), in Orange Lake, Florida. Trans. Am. Fish. Soc., 79, pp. 145-154.

LIFE HISTORY OF THE BLACK CRAPPIE OF LAKES EUSTIS AND HARRIS, FLORIDA

By MELVIN T. HUISH

Florida Game and Fresh Water Fish Commission
Fisheries Experiment Station
Leesburg, Florida

ABSTRACT

A study of the life history of the black crappie *Pomoxis nigromaculatus* (LeSueur), from Lakes Eustis and Harris, Florida, was made in 1952 and 1953.

A comparison of the age composition of the individual and combined samples of 318 Lake Eustis and 403 Lake Harris black crappie showed a similarity existed between the two populations. The scale reading indicated few crappie reached the VIII group or older in Lake Eustis and few reached the VII group or older in Harris. Males and females showed only minor differences in growth. Calculations of growth from scale measurements yielded the following estimates of length at the end of the first eight years of life in Lake Eustis: first—2.0 inches; second—4.4 inches; third—6.8 inches; fourth—8.3 inches; fifth—9.4 inches; sixth—10.4 inches; seventh—11.2 inches; and eighth—11.7 inches. Results of calculations of crappie from Lake Harris were: first—1.9 inches; second—4.2 inches; third—6.6 inches; fourth—8.5 inches; fifth—9.8 inches; sixth—11.2 inches; seventh—12.2 inches; eighth—13.0 inches and ninth—13.8 inches. A comparison of growth with other areas in the Southeast, indicated growth of Eustis and Harris crappie was slower and they lived longer.

An analysis of the length-frequency distribution of 1,888 fish from Lake Eustis and 3,521 from Lake Harris did not aid materially to substantiate age and growth calculations based on scale measurements. Selectivity of the net resulted in a pronounced bias.

Sex ratio varied during the months of study. It was found males were fewer than females during the period of examination. A similarity of sex ratios existed between crappie of the two lakes. Progression to spawning condition of both sexes was noted during the study in both lakes.

A comparison of average weight of catches per haul and temperature data indicated larger catches were made during the colder months.

Length-weight data of 1,471 black crappie from Lake Eustis and 2,118 from Lake Harris is presented.