Proceedings of the Iowa Academy of Science

Volume 68 | Annual Issue Article 37

1961

White and Black Crappies in Clear Lake, Summer, 1960

Richard A. Neal
Iowa State University

White and Black Crappies in Clear Lake, Summer, 1960[1]

RICHARD A. NEAL[2]

Abstract. Studies of white crappie, *Pomoxis annularis,* and black crappie, *Pomoxis nigromaculatus,* showed a shift in the population in Clear Lake during the past 10 years from a dominance of black to white crappies. A decrease in the rate of growth of black crappies was shown for this period although the rate of growth of white crappies has remained constant. The food habits of white and black crappies were very similar. The three most important food items were Cladocera, fish, and insect larvae, in that order. Young-of-the-year samples indicated that the trend toward white crappies was continuing. Turbidity was suggested as a possible reason for these changes.

This study of the white crappie, *Pomoxis annularis,* and the black crappie, *Pomoxis nigromaculatus,* was made at Clear Lake, Iowa, during the summer of 1960. Food habits and rates of growth were studied in an effort to discover better methods of managing these important fish. During the summer, 347 white and 58 black crappies were examined. This ratio of 86 white to 14 black crappies contrasts sharply with the ratio of 84 black to 16 white reported for Clear Lake crappies from 1941 to 1950 by Erickson (1952). This indicates a shift in the population from black to white crappies between 1950 and 1960.

METHODS

Approximately 90 percent of the crappies were taken with a trawl or with experimental gill nets which were set for 24-hour periods once a week. The remainder were taken with a bag seine or an electric shocking apparatus. They were taken randomly from all parts of the lake, during both day and night. White crappies were taken in about equal numbers with gill nets and the trawl while 70 percent of the black crappies were taken with the trawl. The trawl was used only in the deeper parts of the lake, and the gill nets were usually set near shore. No size difference was noted between crappies taken with the trawl and those taken with gill nets.

Lengths and weights were recorded, and scale samples were collected from all crappies. The scale samples were placed in

[1] Journal Paper No. J-4096 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa. Project No. 1374 of the Iowa Cooperative Fishery Research Unit, sponsored by the Iowa State Conservation Commission and Iowa State University of Science and Technology, with the cooperation of the Fish and Wildlife Service, United States Department of Interior. This paper is the result of study under the National Science Foundation Undergraduate Research Participation Program at Iowa State University. Dr. D. E. Hudson is Director of the program, and Dr. K. D. Carlander directed this research project.

[2] Iowa Cooperative Fishery Research Unit, Iowa State University, Ames.

envelopes and later analyzed by making plastic impressions and reading them with the use of a microprojector.

Stomachs were taken from approximately 35 percent of the fish, preserved in formalin, and later the contents were examined under a binocular microscope. The location of capture, type of gear used, and time of day were also recorded for each fish.

Annulus Formation

White crappies taken on June 7, 15, and 23 had not yet formed an annulus for that year. The annulus was being formed on white crappies taken on June 9, 14, 22, 24, 25, 27, 29 and on July 7 and 19. Crappies with that year's annulus formed were taken from June 9 on.

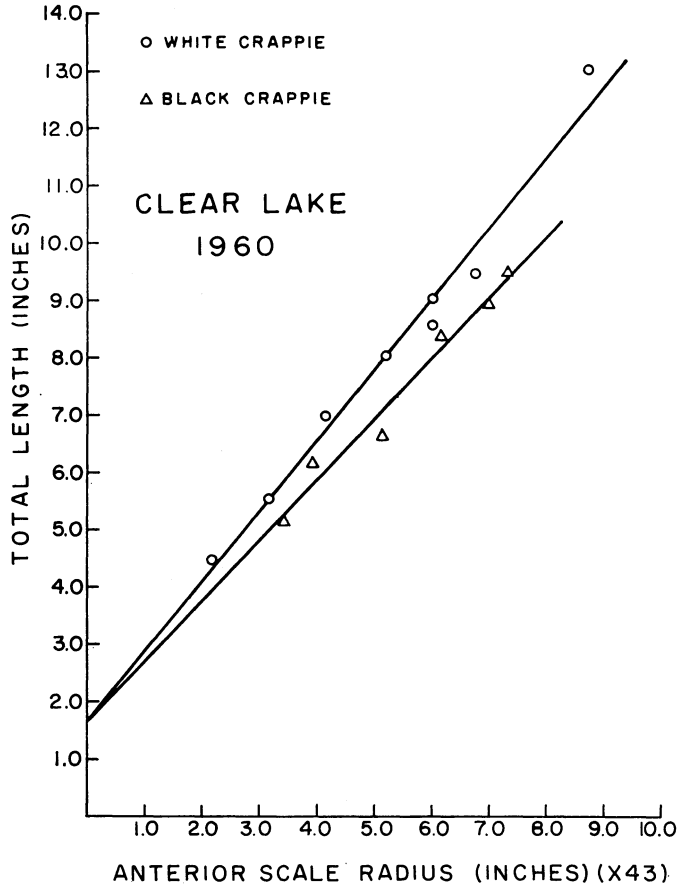

Figure 1. Body-scale relationships of white and black crappies, Clear Lake, Iowa, 1960.

One black crappie taken on June 6 was forming an annulus. All other black crappies were taken after June 24, and the annulus was formed in all cases.

Body-Scale Relationship

As the scales were read on the microprojector, the anterior scale radius (magnified 43 times) was marked on a strip of paper for each fish. These strips were arranged in 1-inch groups according to the length of the anterior scale radius. Samples from each inch-group were randomly selected, and the mean total length of the fish was plotted against the mean anterior scale radius for each inch-group. The straight line which best fit these values for the white crappie had a slope of 1.238 and an intercept at 1.627 inches (Fig. 1). Erickson (1952) found an intercept at 1.51 inches and a slope of .960 for Clear Lake white crappies. It was assumed that the growth of the scales was directly proportional to body growth. The total length at each annulus was calculated with a nomograph using the intercept of 1.6 inches (Carlander and Smith, 1944).

When total length was plotted against anterior scale radius of the black crappies, a straight line with a slope of 1.059 and an intercept at 1.689 inches was obtained (Fig. 1). Erickson (1952) found an intercept at .44 inches and a slope of .957 for black crappies.

Growth

White crappies from 0 through 7 years old were found but beyond the first winter most were age group III, the 1957 year class (Table 1). Apparently the rate of growth of white crappies (Table 2) had not changed significantly since 1950. However, only data for the first three age groups were available for 1950 (Erickson, 1952). The rate of growth of Clear Lake white crappies was found to be about the same as that of white crappies

Table 1. Mean total length in inches and mean weight in grams by age groups, white crappie

Age group	Numbers	Length		Weight	
		Mean	Range	Mean	Range
0—July 19-27	46	1.1	0.9-1.7	..	..
0—Aug. 4-9	26	1.5	1.1-1.9	..	..
0—Aug. 18-24	60	2.0	1.2-2.8	..	..
I	29	5.38	4.1-6.5	32.5	12-61
II	22	7.24	5.1-7.9	82.5	31-109
III	86	7.69	7.0-8.8	96.0	65-204
IV	13	8.40	7.1-9.6	119.8	70-176
V	4	9.02	8.8-9.4	152.7	137-165
VI	1	9.5	..	178	..
VII	1	13.0	..	470	..

Table 2. Growth of white crappies in Clear Lake, 1960

Age group	Numbers	Mean calculated total lengths in inches at each anulus						
		1	2	3	4	5	6	7
I	29	3.48						
II	22	2.88	5.83					
III	86	2.63	5.63	7.25				
IV	13	2.68	5.55	7.15	7.98			
V	4	2.92	6.05	7.32	8.25	8.70		
VI	1	2.9	5.3	6.4	8.0	8.7	9.1	
VII	1	3.0	6.7	9.2	10.8	11.6	12.3	12.7
Mean	156	2.84	5.68	7.25	8.19	9.18	10.7	12.7
Mean annual increment		2.84	2.98	1.61	.93	.55	.55	.4
1941-50 mean*:	44	2.0	5.1	7.4				

* Erickson (1952).

in other Iowa lakes but less than that listed for most lakes in other states (Carlander, 1953).

Black crappies from 0 through 8 years old were found (Table 3), and the older year classes were better represented than the younger fish. This is probably related to the relative decline of this species compared to the white crappies. After the black crappies reach 7 to 8 inches they apparently grow rather slowly in Clear Lake now, although growth prior to 1950 was much better (Table 4). The calculated growth for the first two years is good, but in later years growth is slow compared to that reported in other lakes (Carlander, 1953). Buchholz (1960) reports a decrease in the rate of growth of yellow bass, *Roccus mississippiensis*, in Clear Lake from 1951 to 1958, with this species showing little or no growth after reaching 6 to 7 inches in length. It is interesting to note that, although yellow bass and black crappie showed a decrease in rate of growth during this period, the white crappies did not show a similar decrease.

Food Habits

Of 117 white crappie stomachs examined, only one was com-

Table 3. Mean total length in inches and mean weight in grams by age groups, black crappie

Age group	Numbers	Length		Weight	
		Mean	Range	Mean	Range
0—July 19	3	1.1	0.1-1.3	..	..
0—Aug. 4-9	7	1.6	1.3-1.7	..	..
0—Aug. 18	2	2.1	2.0-2.3	..	..
I	5	5.80	5.1-6.4	45.6	33-58
II	3	6.60	6.1-7.5	67.3	52.94
III	10	7.25	6.5-8.0	85.4	60-120
IV	7	8.53	8.1-8.9	137.1	120-159
V	19	8.81	7.2-9.8	148.2	94-195
VI	10	9.42	8.7-10.0	188.8	151-234
VII	3	9.03	8.8-9.4	158.3	146-179
VIII	1	8.5	..	155	..

Table 4. Growth of black crappies in Clear Lake, 1960

Age group	Numbers	Mean calculated total length in inches at each anulus							
		1	2	3	4	5	6	7	8
I	5	3.86							
II	3	2.77	5.47						
III	10	2.90	4.98	6.61					
IV	7	3.70	5.91	7.51	8.17				
V	19	3.34	5.58	6.82	7.93	8.51			
VI	10	3.22	5.38	6.57	8.06	8.64	9.16		
VII	3	3.17	5.03	5.70	6.50	7.73	8.13	8.70	
VIII	1	2.8	3.4	5.6	5.9	7.6	7.8	8.0	8.3
Mean	58	3.28	5.39	6.11	7.85	8.45	8.84	8.52	8.3
Mean annual increment		3.28	2.16	1.33	1.08	.67	.47	.48	.3
1941-50 mean*:	229	2.3	5.1	7.2	8.7	10.2	11.6	11.9	

* Erickson (1952).

pletely empty. Eighty-one stomachs were at least one-half full. Cladocera made up one-half or more of the total stomach contents in 49 percent of the stomachs. The Cladocera were largely *Bosmina, Daphnia* and *Leptodora.* They were most abundant in stomachs taken in June and July. Fewer of the stomachs taken in August contained Cladocera, and the percentage of the stomach contents made up of Cladocera was much less during August. Copepods were present only in very small numbers and did not constitute a significant part of the total stomach contents.

Although insect larvae and pupae were found in 47 percent of the stomachs, they made up 10 percent or more of the total volume in only 12 stomachs. Insect larvae and pupae most often found in white crappie stomachs were midge (Tendipedidae), mosquito (Culicidae), mayfly (Ephemeroptera), biting midge (Ceratopogonidae) and caddisfly (Trichoptera). Insect larvae were most abundant in stomachs taken in June. However, they were common in stomachs taken throughout the summer.

Fish or fish scales made up one-half of the total contents in 22 percent of the stomachs. Fish scales were never present in large quantities and were always small, indicating that they were from fish the crappies had eaten. Although most of the fish were under 1 inch in length, some larger ones were found in stomachs taken later in the summer. Those identified were yellow bass. Fish and fish scales were found in stomachs throughout the summer but became abundant after about July 20. This can be accounted for by the fact that young-of-the-year of usable size were abundant after mid-July. Fish were eaten by small crappies as well as the larger ones. The smallest crappie which had eaten fish was 4.7 inches in length.

Plant material and insect adults never accounted for more

than 5 percent of the stomach contents. Insect adults most commonly found were water boatmen (Corixidae) and backswimmers (Notonectidae). At least some unidentified digested material was found in nearly all stomachs. In many cases this material made up a large part of the stomach contents. Other food items which occurred in the stomachs included Ostracoda, fish eggs, plant seeds, algae, Hydracarina, Nematoda, unidentified Crustacea, and insect eggs.

Of 30 black crappie stomachs examined, four were completely empty. The items found in these stomachs were similar to those found in white crappies in both frequency of occurrence and abundance (Table 5). Black crappies, like white crappies, fed

Table 5. Frequency of occurrence of food items in crappie stomachs

Item	Percentage of stomachs containing item	
	White crappie	Black crappie
Cladocera	79	77
Insect larvae or pupae	47	57
Copepoda	41	23
Fish or fish scales	37	50
Plant material	19	7
Insect adults	13	27
Unidentified crustacea	9	3
Ostracoda	8	17
Fish eggs	3	..
Number of stomachs	117	30

less heavily on Cladocera and more heavily on fish as the summer progressed. The food of 57 black crappies examined in the summer of 1950 (Erickson, 1952) was much the same as in 1960 except that more of the crappies had eaten fish in 1960 (50%) than in 1950 (6%).

Discussion

Although young of both species were collected in the summer of 1960 (Tables 1 and 3), the white crappie fingerlings outnumbered the black by over 130 to 12 in a series of seine hauls at weekly intervals. It would, therefore, appear that the trend toward white over black crappies is continuing. Harlan and Speaker (1956, p. 138) indicate that the white crappie is more tolerant of turbid waters than is the black. Secchi disk readings in Clear Lake in the 1951 summer averaged 58 inches (Pearcy, 1953) compared to readings of 22 to 24 inches in 1958-60, indicating a significant increase in turbidity.

Acknowledgments

The author wishes to express his appreciation to Bill Welker,

Larry Small, and James Sinning for their help in the collection of data. Dr. Kenneth D. Carlander has been of much assistance in the interpretation of data and the writing of this paper. Thanks also go to Robert Cooper, Fish Culturist, State Fish Hatchery, Clear Lake, and other State Conservation personnel, who have provided equipment and facilities which aided in this study.

Literature Cited

Buchholz, M. M. 1960. Ecological relationships associated with decreasing growth rate of Clear Lake yellow bass. Ph.D. thesis. Iowa St. Univ., Ames, Iowa.

Carlander, K. D. 1953. Handbook of freshwater fishery biology with first supplement. Wm. C. Brown Co., Dubuque, Iowa. 429 pp.

———— and L. L. Smith, Jr. 1944. Some uses of nomographs in fish growth studies. Copeia 1944:157-162.

Erickson, J. G. 1952. Age and growth of the black and white crappies, *Pomoxis nigro-maculatus* (Le Sueur) and *Pomoxis annularis* Rafinesque, in Clear Lake, Iowa. Iowa State J. Sci. 26:491-505.

Harlan, J. R. and E. B. Speaker. 1956. Iowa fish and fishing. Iowa St. Conserv. Comm. Des Moines, Iowa. 377 pp.

Pearcy, W. G. 1953. Some limnological features of Clear Lake, Iowa. Iowa State J. Sci. 28:189-207.