Illinois Academy of Science Transactions, Vol. 46, 1953

TIME OF FEEDING OF THE BLACK CRAPPIE AND THE WHITE CRAPPIE

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Hansen (1951) in reporting the biology of the white crappie cited some unpublished data collected by David H. Thompson pertaining to differences in day and night hoop-netting catches of black crappie (*Pomoxis nigromaculatus*) and white crappie (*Pomoxis annularis*). He stated that "morning raises yielded more blacks than whites, evening raises more whites than blacks."

During the winter of 1952 the authors became interested in seeing if this experiment could be repeated in the laboratory and, if so, whether the difference in the catch was because of a difference in the feeding times of the two species.

The crappies used in this experiment were obtained from Lake Chautauqua near Havana, Illinois, and had been kept in an aquarium approximately two months. Five white crappies were placed in one of two 300 gallon aquaria and five blacks in the other.

There was a continuous flow of dechlorinated water into each aquarium and the water temperature was equalized in the two aquaria by increasing or decreasing the rate of flow. The temperature fluctuated from 16° to 22° C. during the experiment but there was never more than 1° difference between the aquaria at any one time. They were located in a greenhouse where light conditions were comparable to those out-of-doors.

By January 7, 1953, preliminary trials had indicated the desirability of the following procedures. Minnows were chosen as the only food for the crappie. We intended to use only bluntnose minnows (*Hyborhynchus notatus*) but on a few occasions when these were not available a few silverjaw minnows (*Ericymba buccata*) and still fewer creek chubs (*Semotilus atromaculatus*) were used. When the minnow species was changed in one aquarium, it was simultaneously changed in the other. The feeding times were so arranged that there were always some minnows present. The number was restored to ten at each of the times minnow counts were made at 6:00 A.M., 8:00 A.M., 4:00 P.M., and 6:00 P.M. Because so many minnows were eaten during the morning and evening periods, minnow counts were also made at 7:00 A.M. and 5:00 P.M. The first four checking points divide the winter day into four periods, one completely dark, one completely light, one growing dark (dusk), and one growing light (dawn).

After eight days of observations, each species was removed to the aquarium previously occupied by the other. This was done in order to rule out any possible unforeseen environmental differences which could have influenced the feeding time. The experiment was then continued until February 10, 1953.

TABLE 1.—THE NUMBER OF MINNOWS EATEN BY BLACK CRAPPIES AND THE TOTAL NUMBER OF HOURS FOR EACH PERIOD

	Dawn 6-7	7-8	Day 8-4	Dusk 4-5	5-6	Night 6-6
Minnows eaten: January 7–January 14	13	7	4	30	46	98
January 15–January 25	9	6	3	10	14	37
January 26–February 10	10	1	2	2	22	17
Total minnows eaten	32	14	9	42	82	152
Total Hours	19	19	240	32	32	228

Table 1 shows the number of minnows consumed by the black crappies during each period and the total number of hours during which these minnows were eaten.

Table 2 for the white crappies shows that they ate a total of 580 minnows as compared to the 331 eaten by the blacks. Because the white crappies ate more they were fed larger minnows in order to decrease the possibility of all ten minnows being consumed during any one period. Therefore, the difference between the two species in the total volume of food eaten is even greater than suggested by these figures.

Table 3 shows the percentage of food consumed in each period. The chief difference between the species is found in the day period. Though the white crappie fed less during the day than at any other time, the amount eaten then (19 percent) greatly exceeded that of the black crappie (2.7 percent). Because the dusk and dawn feedings of the two species were so nearly the same, the night feeding of the black crappie would necessarily be greater than that for the whites.

In order to treat the data statistically we used the average percentage of food consumed per hour for

TABLE 2.—THE NUMBER OF MINNOWS EATEN BY WHITE CRAPPIES AND THE TOTAL NUMBER OF HOURS FOR EACH PERIOD

	Dawn 6-7	7-8	Day 8-4	Dusk 4-5	5-6	Night 6-6
Minnows eaten: January 7–January 14	27	19	39	34	37	113
January 15–January 25	17	10	44	20	18	57
January 26–February 10	12	4	27	12	47	43
Total minnows eaten	56	33	110	66	102	213
Total Hours	19	19	240	32	32	228

TABLE 3.—THE PERCENTAGE OF TOTAL FOOD CONSUMED DURING EACH OF THE FOUR PERIODS

	Dawn 6-8	Day 8-4	Dusk 4-6	Night 6-6
Black Crappies	13.9	2.7	37.5	45.9
White Crappies	15.3	19.0	29.0	36.7

each species for each period. It was necessary to use percentage of food eaten rather than number of minnows in the comparison because of the difference in size of minnows.

In order to show the rate of feeding for the different periods, the average percentage of food eaten per hour is presented in table 4. It is interesting to note that the period of greatest feeding intensity for both species was at dusk, though the percentage per hour was somewhat greater for black crappies than for the whites. The rate of feeding at dawn was much less than at dusk for both species. The rate at night dropped to about half of that at dawn for both species, and the rate during the day for the whites is about eight times that of the blacks.

Statistical "t" value comparisons were made not only to determine the intensity of feeding activity for each of the two species of crappie but also to compare the feeding rates of the blacks with that of the whites at different periods of the day.

For black crappie the differences between day and dusk, day and night, and dusk and night were significant to the .01 level. The difference between day and dawn (.05) is also significant though not to as high a degree.

For the white crappie the differences between the day and dusk, and day and dawn were significant to the .01 level but none of the other period differences were significant because they did not reach the .05 level.

When the activity of black crappie was compared with that of the whites for corresponding periods the difference between the two species for the day period was significant to the .01 level. All other differences were not statistically significant to the .05 level; however, the results tend to indicate that black crappies

TABLE 4.—THE PERCENTAGE OF TOTAL FOOD CONSUMED PER HOUR DURING EACH OF THE FOUR PERIODS

	Dawn 6-8	Day 8-4	Dusk 4-6	Night 6-6
Black Crappies	6.9	0.3	18.7	3.8
White Crappies	7.6	2.4	14.5	3.1

are more active than white crappies during the night and dusk periods while whites are more active than blacks during the dawn period.

It is interesting to compare the numbers of black and white crappies reported hoop-netted by Thompson with the percentage of day and night food consumption in the present experiment. Thompson reported 3,063 white crappie taken during the night set and 1,376 during the day. There were 6,886 black crappie taken during the night and only 879 during the day. In other words, about 89 percent of the blacks were caught at night as compared to the 70 percent of whites caught at night. Because Thompson's night period included what we called dusk, night, and dawn, we totaled these three periods in our experiment for comparison. We found 97 percent of the activity for the black crappie to be during these periods in comparison to his 89 percent. Similarly, we found 81 percent of the activity of the whites to be in these periods as compared to his 70 percent. These results agree in indicating that white crappies are more active during the day than blacks. They should not be interpreted to mean that the black crappie is nocturnal and the white diurnal. Such a statement is made by Allee et al. (1949), who used this to account for the speciation of the two crappies. The small difference in their activity could hardly account for their reproductive isolation.

Clausen (1936) in his study of the hourly oxygen consumption of several species of fishes included the white crappie. It is interesting to note that the periods of greatest oxygen consumption corresponded to the dawn and dusk periods. As Clausen's fish were without food it would appear that crappies have a natural tendency to be active at these periods.

Summary

1. Under laboratory conditions both black and white crappies had a daily rhythm in feeding activity.

2. The feeding activity of both species was more intense at dawn and dusk.

3. The most striking difference between black and white crappie feeding time was during the day when the whites fed about 8 times as much as the blacks, though this was also the period of lowest feeding intensity for the white crappie.

4. The differences in feeding activity of white and black crappies appeared to be very similar to the differences in catches of day and night hoop-netting.

5. Periods of feeding activity for both species corresponded to the period previously found to have the greatest oxygen consumption in the white crappie.

REFERENCES

Allee, W. C., et al., Principles of animal Ecology: Philadelphia, Saunders, 1949.

Clausen, Ralph G., Oxygen consumption in fresh water fishes. Ecology 17(2): 216-226, 1936.

Graham, J. M., Some effects of temperature and oxygen pressure on the metabolism and activity of the speckeled trout, *Salvelinus fontinalis*. Canadian Jour. of Res. D, 27: 270-288, 1949.

Hansen, Donald F., Biology of the white crappie in Illinois. Bull. Ill. Nat. Hist. Surv. 25 Art. 4: 211-265, 1951.