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SOME NOTES ON THE FOODS OF NORTHERN PIKE AND WALLEYES IN HOUGHTON LAKE, MICHIGAN

by

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The stomach contents of 45 northern pike and 25 walleyes from Houghton Lake, Michigan, were analyzed for this study. Both pike and walleyes were caught by hook and line or by spearing during the months of January and February, 1939, by W. F. Carbine, W. R. Crowe, A. S. Hazzard, and D. S. Shetter of the Institute and Conservation Officer Thomas White. Some of the fish were weighed and measured for length. The viscera of all fish were preserved in 10% formalin.

Northern pike

The average total length of 25 of these fish (those for which lengths were recorded) was 22.2 inches, and the range in length was 16.9 to 28.3 inches. Weights of the same fish ranged from 15.5 to 84 ounces, and averaged 37.4 ounces.

The stomach contents were 100% fish except for a small amount of algae in one stomach. It seems likely that the algae was ingested accidentally, but nevertheless it has been included in the tabulations. Six of the 45 stomachs examined were completely empty. The contents of the

remainder were separated as far as possible to species, and identifications were made by G. P. Cooper. Items not identifiable to species were classified as minnows, centrarchids (other than bass), spiny-rayed fishes, or if too badly disintegrated as just fish remains. Information was obtained as to volume in cubic centimeters of each item of diet in each stomach, the number of individuals of each species, and the number of stomachs in which each food was found (frequency of occurrence). The results are summarized on a numerical and a percentage basis in Table 1. In this table the percentages for volume and number represent the total volume and number of each food type in all stomachs, not the averages of percentages for individual fish.

The reasons for tabulating the results in three ways are twofold. First, there is at present no universally standard method of making stomach analyses, various investigators having used each or all of the three methods; hence in order that the information obtained from this study might be comparable to that found by others the data are presented in each way. Second, it is believed that no one of these methods alone gives a truly accurate picture in the tabulation of results of a food-habits study. By the volumetric analysis, the presence of one large food fish found in only one stomach may give the reader a very false impression of the importance of that species as a food. If only numbers of individual food items are recorded, the presence of a large number of one kind of fish in one stomach alone could also be misleading. In this case, the computed data would show that species as a high percentage of the total number of fish eaten by pike, whereas actually only one pike was involved. The frequency of occurrence (what number of stomachs containing each food type) is only partially significant because it does not indicate the relative quantities eaten. Using the three methods (volume, number, and stomach frequency)

Table 1

Contents of stomachs of 45 northern pike (6 stomachs empty) 16.9 to 28.3 inches in length from Houghton Lake, Michigan, Winter, 1939

Kind of food item	Volume in c.c.	Number of food items	Number of pike stomachs containing food	Percentage of occurrence		
				Volume	Number	In what percent of pike stomachs ✝✝
Common white sucker	101.00	3	3	15.38	3.07	7.69
All minnows ✝	160.20	15	12	24.39	15.31	30.76
Unidentified minnows	3.90	2	1	0.59	2.04	2.56
Common shiner	99.50	5	5	15.15	5.10	12.82
Creek chub	35.30	2	2	5.38	2.04	5.12
Spot-tailed shiner	15.40	2	2	2.34	2.04	5.12
Blunt-nosed minnow	6.10	2	2	0.93	2.04	5.12
Spiny-rayed remains	5.40	2	1	0.82	2.04	2.56
Yellow perch	243.50	34	11	37.08	34.69	28.20
Walleye	6.40	1	1	0.97	1.02	2.56
All centrarchids ✝	95.30	16	13	14.51	16.32	33.33
Centrarchids (not bass)	70.60	10	7	10.75	10.20	17.94
Bluegills	0.90	1	1	0.14	1.02	2.56
Black crappie	10.30	3	3	1.57	3.06	7.96
Black bass	10.50	1	1	1.60	1.02	2.56
Rock bass	3.00	1	1	0.45	1.02	2.56
Unidentified remains	44.90	28	24	6.84	28.58	61.53
Algae	0.10	1	1	0.01	1.02	2.56
Totals	656.80	98	39	100%	100%	...

✝ Subtotals. **(Not included in totals)**

✝✝ Based on 39 stomachs.

together allows a much better appraisal of the results than would any of the three methods alone.

A total volume of 656.8 c.c. of food was obtained from the 39 stomachs; of this amount yellow perch constituted the largest volume (37.08%) for any single species. Minnows as a group composed 24.39% of the total volume and were the second most important food. Although only 3 white suckers were found in these stomachs, their large size placed them as third in importance by volume. Other identifiable species consumed were: common shiners, creek chubs, spot-tailed shiners, black bass, black crappies, walleye, blunt-nose minnows, rock bass, and bluegills. There is some doubt as to the propriety of including the creek chub in this discussion. It is very commonly used as bait, and is not too abundant under natural conditions in Houghton Lake. However, since there were no marks on the specimen examined which could be definitely attributed to hooks, the species has been included in the computations.

Using the second-named method of analyzing stomach contents, i.e., number of individuals of each species, an examination of the data again reveals that yellow perch were the species most frequently eaten by these pike. Of those remains that were identifiable at all, the centrarchids (including bass) were the second most important food, while minnows were third.

According to the third method of analysis, frequency of occurrence, perch were still of primary importance, centrarchids (including bass) were second, and minnows of all species were third.

It will be noted that particularly in the last two mentioned types of analysis, the percentages for unidentified fish remains are very high. This may be explained by the fact that practically all stomachs contained some fish debris which could not be separated into any particular groups.

The volume of this debris was small, being only 6.84% of the total volume, but the percent of the total number of individuals was 28.58%, while 61.53% of the stomachs contained some unidentifiable fish remains.

The voracity of pike is well known and these fish were no exception. A 6.5-inch yellow perch was found in the stomach of a pike 25.9 inches long. Another pike 23.6 inches long contained 18 perch that averaged about 3 inches in length, all of the 18 being in approximately the same degree of digestion. A 33-inch pike from Lake Fifteen, Montmorency County, obtained during this same period of time, contained a partly digested white sucker over 13 inches long with a volume of 140 c.c.

Interpretation of the information obtained by this study must take into account the fact that the subject pike were captured within a few weeks of each other and hence these data should not be considered as indicative of pike food habits throughout the year in Houghton Lake. Further, the mere presence of a large number or volume of any one species of food fish does not necessarily mean that the pike definitely prefers this species as a food, but may indicate only that this food was most readily available to the pike in Houghton Lake at the time of capture.

It may be concluded, from all methods of analysis used, that the yellow perch was the chief item of diet for the pike of Houghton Lake in the winter of 1939. Either centrarchids (including bass), or minnows as a group, were next in importance, depending upon the method used.

Walleye (or yellow pikeperch)

Twenty of the 25 walleyes had an average total length of 17.4 inches, ranging from 14.5 to 23.0 inches, and their weights averaged 29.1 ounces. Twelve of the 25 stomachs were empty, and the contents of the remainder were analyzed by the methods described above. The results of the investigation are summarized in Table 2. The creek chub, lake emerald shiner,

Table 2

Contents of stomachs of 25 walleyes (12 stomachs empty) 14.5 to 23.0 inches in length from Houghton Lake, Michigan, winter of 1939

Kind of food item	Volume in c.c.	Number of food items	What number of stomachs contained food
Sucker sp.	3.8	1	1
Common shiner	16.1	1	1
Common shiner †	6.6	1	1
Golden shiner †	23.0	1	1
Bluntnose minnow	2.1	1	1
Creek chub †	12.0	1	1
Lake emerald shiner †	5.0	1	1
All minnows ††	18.2	2	2
Bullhead	5.2	1	1
Spiny-rayed fish remains	2.2	1	1
Yellow perch	3.5	2	2
Centrarchids (other than bass)	14.9	4	3
Bluegill	2.1	2	2
Pumpkinseed	1.1	1	1
Crappie	3.5	1	1
All centrarchids (no bass)	21.6	8	...
Unidentified remains	2.7	3	2
	57.2 ††	18	...

† Hook-marked bait minnows.

†† Does not include hook-marked bait.

golden shiner, and one of the common shiners found in these walleyes had clearly recognizable hook marks on their backs and obviously were bait. Presumably they should not be considered as normal foods of the walleye of Houghton Lake.

It is believed that the information obtained in the analysis of these stomachs is insufficient on which to base any conclusions other than that these walleyes ate fish exclusively at the time they were caught. However, the data are presented herewith in the hope that they may be of future use as one more record of walleye food.

Summary

1. Forty-five northern pike stomachs from Houghton Lake, Michigan and 25 walleye stomachs from the same body taken in January and February, 1939, were studied. Six of the pike stomachs were empty and 12 of the walleye stomachs were also empty.

2. Three methods were used in analyzing the information obtained from this study: (1) volumetric, (2) number of individuals of each species of food fish, and (3) number of stomachs containing a given food.

3. Yellow perch were the most important food of the pike of Houghton Lake in the winter of 1939. Depending on the method of study used, centrarchids and minnows were the second and third most common groups of food fishes for these pike.

4. Examination of the walleye stomachs indicated that these fish were totally piscivorous during the winter of 1939.

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