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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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DIRECTOR

April 14, 1954

ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

Report No. 1418

THE FISH FAUNA OF THE FOX RIVER SYSTEM, SCHOOLCRAFT COUNTY

By

Gerald P. Cooper

Abstract

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FISH DIVISION

Fish collections by electric shocker were made in October, 1952, at sixteen stations on that part of the Fox River System which lies in Schoolcraft County. Brook trout were found throughout the drainage, while brown trout were found only at one station on the East Branch (about 3 miles below the trout rearing station). The shockers took 7.1 trout per hour in the Fox and Little Fox, as contrasted to 17.9 trout per hour in the East Branch. The burbot was found abundantly in the main Fox and Little Fox, and rarely in the East Branch. Warm-water game species were generally rare. Growth of brook trout in the Fox System was found to be somewhat better than state-wide averages. Average age of Fox River brook trout was found to be similar to that in heavily fished trout streams (N. Branch Au Sable), but less than in brook trout waters generally, indicating that the Fox and its East Branch are heavily exploited by angling.

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Fish collections were made at sixteen stations on the Fox River System (Fig. 1), Schoolcraft County, during October, 1952. The waters included the main Fox River and its tributaries above the town of Seney, and the East Branch of the Fox River above "The Spreads" plus Spring Creek, a tributary which enters the East Branch just below "The Spreads." This survey of the upper portion of the Fox River is a part of the general program of the Institute to conduct surveys of the fish fauna of all the principal drainage systems in the state. There is also special interest in the East Branch of the Fox River, in view of the proposal to establish a "flies only" restriction, plus a higher size limit, on a portion of the stream starting in 1955. The Fox River and its East Branch are a part of the Manistique River drainage system.

The fish collections were made during the period of October 4 to 8, 1952. The field party included Messrs. L. R. Anderson and F. Warren, District Fisheries Supervisors, and Messrs. M. G. Galbraith, T. M. Stauffer and G. P. Cooper of the Institute. The field personnel made up two collecting parties, one operating a Homelite DC shocker (2500 watt, 230 volt) and the other operating a Universal AC shocker (500 watt, 110

Fig. 1. Map of Fox River system in Schoolcraft County showing the locations of 16 fish collection stations, October, 1952

volt). Generally, each party made collections at two stations per day, spending from one to two hours in actual collecting time. Transportation, assemblage of gear, and taking records and scale samples of fish, took up the balance of the work day. Prevailing water temperatures at the collecting sites ranged from 37° to 47°, but in most instances were between 41° & 44° F. Efficiency in operation of the shockers was probably somewhat less at these temperatures than would prevail at higher temperatures, judging from observations reported by Institute personnel working at the Hunt Creek, Pigeon River, and Rifle River stations. However, during the present study the shockers appeared to be quite effective in collecting fish.

At the sixteen stations, a total of 235 trout were taken by shocker. Thirty of the larger trout were scale sampled and liberated at the point of capture. Also an occasional large sucker, pike, etc., was liberated. All other fish taken by shocker were preserved for enumeration and study in the laboratory. Dr. Robert R. Miller, Associate Curator of Fishes in the Museum of Zoology, University of Michigan, kindly verified the identification of most preserved specimens (except for the trout and burbot which were turned over to other Institute staff members for studies of growth and feeding habits, respectively). Mr. Edward E. Schultz made age determinations on the trout scale samples. Habitat photographs taken at stations No. 3, 10, and 12 are on file at the Institute.

During the operation of the shockers, it was the observation of the field parties that fish were generally quite rare at most of the stations. The parties worked intensively to obtain the fish which are recorded in Table 2. Under-water cover for fish was generally fair to good at most stations, but many pieces of good cover (logs, stumps, alder clumps) had

no trout at all, and many of them had only one or two fish. At most stations the stream bottom was 80 to 90 per cent shifting, barren sand. Fish food organisms were abundant only in limited muddy areas along stream banks, or in silt beds behind deflectors, or occasionally in brush piles and other types of fish cover. At several of the collecting stations, stream improvement devices (deflectors, etc.) had been installed, and such installations made up about half of all available fish cover. Proportionately, about half of all trout and burbot collected came from these installations.

Data on the localities of the sixteen stations and on collecting effort are given in Table 1. A complete record of the number of each species of fish taken in these collections, listed according to the main river and its tributaries, is given in Table 2.

Trout were found throughout most of the drainage. These were entirely brook trout, except for four browns taken at Station 16 on the East Branch of the Fox River about 3 miles below the trout rearing station.

The collections contained 62 burbot which ranged in length from 5.4 to 11.6 inches and averaged 7.5 inches. The burbot was abundant in the main Fox River and in the Little Fox River, and was also present in the East Branch but much less abundant there than in the main Fox. In contrast to the burbot, trout were more abundant in the East Branch than in the main Fox or the Little Fox, judging from numbers of fish taken per hour of shocking. A summary of the number and weight of trout and burbot taken per hour of shocking in the East Branch of the Fox as compared with the main Fox (plus Little Fox) is given in the following (shocking time on the main Fox was 61% by D.C., 39% by A.C.; on the East Branch, 57% by D.C., 43% by A.C.):

Table 1.--Localities of 16 fish-collection stations on Fox River System and data on collecting effort with DC or AC shocker

Stream, and station number	Location of station				Linear yards of stream covered	Width of coverage, feet	Minutes of shocking time	Type of shocker	Date, 1952
	Description	T, N	R, W	Sec.					
Little Fox River (3)	Just below Stanley Lake	47	15	11	300	12	90	D.C.	Oct. 5
Little Fox River (4)	In N.E. 1/4 Sec. 13	47	15	13	250	8	60	D.C.	Oct. 5
Little Fox River (5)	In S. part Sec. 19	47	14	19	100	18	90	A.C.	Oct. 6
Little Fox River (9)	1/2 mi. above junction with Fox River	47	14	32	200	20	90	A.C.	Oct. 7
W. Br. Fox River (7)	25 yds. below, to 175 yds. above Taylor Dam	47	14	5, 8	200	10	90	A.C.	Oct. 6
Fox River (11)	1-1/2 mi. above Wagner Dam	47	14	4	150	12	90	A.C.	Oct. 7
Fox River (8)	Just below Wagner Dam	47	14	9	150	20	60	D.C.	Oct. 6
Fox River (12)	In W. 1/2 of Sec. 21	47	14	21	300	30	90	D.C.	Oct. 7
Fox River (6)	Downstream from mouth of Little Fox River	47	14	33	400	40	90	D.C.	Oct. 6
Fox River (10)	In E. 1/2 of Sec. 11, at Public Fishing Site	46	14	11	300	30	90	D.C.	Oct. 7
Fox River (14)	In N.W. 1/4 of Sec. 29	46	13	29	200	40	90	D.C.	Oct. 8
E. Br. Fox River (2)	From bridge near 6-7 sectionline, upstream	47	13	6,7	250	8	60	D.C.	Oct. 4
E. Br. Fox River (1)	Just above rearing station	47	13	6	400	15	120	D.C.	Oct. 4
E. Br. Fox River (16)	In N.E. 1/4 of Sec. 5	46	13	5	150	20	60	D.C.	Oct. 8
E. Br. Fox River (15)	At Robinson's	46	13	9	150	40	90	A.C.	Oct. 8
Spring Creek (13)	In N. 1/2 of Sec. 13	46	13	13	65	8	90	A.C.	Oct. 8

Table 2.--Number of specimens, by species, of fish in 16 shocker collections from Fox River System, Schoolcraft County, October, 1952

Species	Locality and Station number															
	Little Fox River				West Branch	Fox River					East Branch Fox River				Spring Creek	
	3	4	5	9	7	11	8	12	6	10	14	2	1	16	15	13
Brook trout		15	13	11		11	6	22	13	19		38	46	25	4	8
Brown trout														4		
Northern pike	1															
Yellow perch							1									
Rock bass								1								
Brown bullhead	3								1							
Burbot	11	6			1	1	7	12	2	11	7			1	3	
White sucker	40	7	1					59	2	1	1					
Creek chub	1	17	10				1	4				1	1			
Blacknose dace	6	7	1						3					1		3
Longnose dace										1	2		1			
Finescale dace																1
Blacknose shiner	1															
Bluntnose minnow								1								
Mudminnow											2					4
Iowa darter	1															
Johnny darter											1					
Muddler (<i>C. bairdi</i>)	11	25	17	12	9		12	60	14	14	9	63	105	30	35	20
Brook stickleback											1			1	2	2
American brook lamprey																
Adults	36	9					2	3	1		1	3	2		1	
Ammocoetes	36	41	3	7	1		79	40	50	59	45	61	25	13	16	

	Trout		Burbot	
	Number	Ounces	Number	Ounces
Fox R. and tribs., 15.5 hours of shocking:	7.1	8.4	3.7	6.7
E. Br. Fox R. and tribs., 7 hours of shocking:	17.9	11.6	0.6	1.7

One possible interpretation of the above figures is that the trout-carrying capacity of the main Fox and the Little Fox is partly taken over by the burbot, and this might account, at least in part, for the lower population of trout in these streams as compared to the East Branch. The possible relationship of trout and burbot in trout streams is worthy of study. Mr. Robert Beaton, a summertime employee of the Institute, is currently studying the food habits of the burbot.

It is especially noteworthy that all of the muddlers collected were of the species Cottus bairdi, whereas Cottus cognatus was not found at all. The fish distribution maps in the University Museum of Zoology contain no records of C. cognatus for the entire Manistique River System, or for other nearby drainage systems along the Lake Michigan shore of the Upper Peninsula. In much of the Fox River drainage the waters are cold enough to support C. cognatus (which is usually associated with good brook trout water), but presumably the species has not gained entrance into suitable waters in this part of the state.

The collections contained a total of 437 Cottus bairdi. Individual length measurements, plotted as length frequencies for the different streams separately, reveals a well defined size group (for each stream) from 0.9 to about 2.3 inches and this size group is judged (on the basis of the frequency distribution) to be young of the year (1952). The remainder of the length frequency distribution is suggestive of possibly two or three additional age groups in the length range from 2.4 to 4.8 inches, but this is not at all a certainty, and it might be that only a single age group

was represented by the 2.4-4.8 size range. Judging from the large sample measured here, it is concluded that age determinations on other than the young-of-the-year age group would have to be based on a study of bones or fin-ray sections rather than on size frequencies. (Original data are on file with the Institute copy of this report.)

Among the numerous lampreys collected (both ammocoetes and adults), only the American brook lamprey (Lampetra lamottei) was represented.

Minnows were generally rare in these Fox River collections.

Of the 231 brook trout collected, the 201 which were preserved were examined carefully for presence of gill lice. Thirteen collections contained preserved trout, and among 12 of these collections at least some trout were found to be carrying lice. The one station where no infested trout were encountered was on the Fox River, 1-1/2 miles above Wagner Dam (10 brook trout in the collection). Of the 201 preserved brook trout, 96 had lice, from 1 to 8 (mostly 1 or 2) lice per fish. Most lice were found in the gill region or attached to the pectoral or pelvic fins.

Age determinations from scales were made on all trout (except for some of the smaller young-of-the-year, judged to be certainly of that age); the age and growth data are summarized in Table 3. Growth averages for the Fox River collections have been compared with state-wide growth averages for brook trout, recently compiled by E. E. Schultz (I.F.R. Report No. 1417). As compared to state-wide averages, 0-trout from the Fox were somewhat larger, I-trout were about the same, and the 4 II-trout were considerably larger. It is concluded that rate of growth of brook trout in the Fox compares favorably with growth of trout throughout the state. It is especially noteworthy that, among Fox River trout, no fish older than II-year-olds were obtained at any of the stations, and that no fish older than I-year-olds were included among the 117 trout from the East Branch.

Table 3.--Age and total lengths in inches of brook trout (4 browns at bottom of table) in Fox River collections, October, 1952

Stream, and width classification	Age groups								
	0			I			II		
	Number of fish	Total length		Number of fish	Total length		Number of fish	Total length	
	Average	Range		Average	Range		Average	Range	
Little Fox R. (under 20')	22	3.6	2.7-4.6	16	5.7	4.4-8.2	1	9.4	9.4
Fox R. (upper part) (under 20') Sta. 11 only	7	4.1	3.1-4.8	3	5.5	5.0-6.0	1	11.5	11.5
Fox R. (lower part) (over 20')	43	4.1	3.2-4.9	15	6.8	5.4-9.2	2	13.9	11.6-16.1
E. Branch Fox R. (upper part) (under 20') Stas. 1 and 2	50	3.8	2.4-4.9	34	6.0	4.6-8.4	...	...	...
E. Branch Fox R. (lower part) (over 20') Stas. 15, 16	23	3.7	2.9-4.5	6	5.9	5.5-6.9	...	...	...
Spring Creek (under 20')	8	3.8	3.1-4.5	...	...	...	...	...	...
Brown trout from E. Branch Fox R. (lower part) (over 20') Sta. 16	3	4.5	4.4-4.6	1	6.3	6.3	...	...	...

A comparison is made, herewith, between the age-frequency distribution among Fox River brook trout and that of brook trout from other Michigan streams. Such a comparison gives some indication of the rate of exploitation by angling--the heavier the fishing intensity, the fewer are the numbers of legal-size trout (fish of older age-groups, II and older) left in a stream.

The age-frequency distribution of brook trout among the Fox River collections is significantly different from (Fox River trout younger than) the state-wide collections summarized by Schultz (I.F.R. Report No. 1417), but the comparison is not valid because the state-wide samples are far from random in relative numbers of fish in different age groups--due to methods of collecting. A valid comparison can be made, however, with samples listed by E. L. Cooper (doctoral thesis, U. of Mich., 1949, Table 2) which were collected by shocker or derris powder from waters (mostly streams) throughout Michigan. For example, E. L. Cooper lists samples from the North Branch of the Au Sable River containing 456 young-of-the-year, 205 I's, and 11 II's, and these figures may be compared with the brook trout in the Fox River (1952) samples which included 153 young-of-the-year, 74 I's, and 4 II's. Here Chi-square is 0.11 which means that the sample distribution is not different; in other words, the Fox River trout have about as high a mortality rate (presumably due largely to angling) as trout in the North Branch. Other trout samples selected for this comparison are included in the following:

	Number of trout in age groups:				
	<u>0</u>	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
N. Br. Au Sable R.	456	205	11	0	0
Fox River (prior to 1949)	126	37	14	0	0
Hunt Creek	261	226	111	7	0
State-wide totals (from E. L. Cooper)	1,718	1,204	434	79	5
Fox River System (1952)	153	74	4	0	0
E. Br. Fox (1952)	81	40	0	0	0

By Chi-square analysis it is concluded that the Fox River samples of 1952 were not significantly different in age distribution from the Fox River samples collected prior to 1949 (Chi-square = 4.9, P = 0.09); in other words, the Fox River trout were predominantly younger fish prior to 1949 as well as in 1952. On the other hand, the Fox River trout were significantly younger than trout from Hunt Creek ($\chi^2 = 38.6$, P = less than 0.01), and younger than all trout collections in the fifteen Michigan waters listed by E. L. Cooper ($\chi^2 = 34.0$, P less than 0.01).

The conclusion is that the Fox River samples represent a population of brook trout on which the exploitation by angling is about as extreme as on the most heavily fished waters throughout the state; and this applies even more to the East Branch than to the other waters of the Fox system included in the present study.

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