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Results From Artificial Feeding of Wild Brook Trout in Hunt Creek, Montmorency County, Michigan

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The question is sometimes asked, "Why don't you feed wild trout directly in the natural stream to encourage their growth and/or aid in their survival to the creel?" It is pointed out with some logic that monies might be saved if the hatching, rearing, and transportation of artificially raised trout could be replaced by a program of feeding the naturally spawned fish in their native stream. This assumes that feeding on natural streams might add more trout to the creel than is accomplished by the present hatchery operation.

There is little of printed record in American fisheries literature concerning feeding trout in streams. Cumings (1933) added food to 300 feet of an unnamed Michigan trout stream from July 1 to October 1. The type and amount of food used were not mentioned. According to his visual observations he was successful in increasing the number and size of fish present in the stream area where the food was introduced.

Hewitt (date not given), in describing his "Balanced Trout Feed," reported that with the use of his food "... at least ten times the number of trout can be carried in a stream that can live there on natural feed ...."

Greeley (1951), after observations on reportedly successful supplemental stream feeding operations on private New York state waters,

stated: "Experimentation and development has [sic] been most extensive on private waters, and for obvious reasons intensive management of this kind on public waters cannot be expected to spring up over night."

Greeley and others have theorized that the artificial addition of food should contribute to increased growth and/or survival, and in the end should provide better fishing. However, none of the writers listed above offered any concrete evidence of either better fishing, favorable changes in population numbers, or increased growth resulting from feeding.

Parker (1954) reported starting supplemental feeding on Guiley Pond during 1937. This 1.75-acre pond is located on a tributary of the East Branch of the Au Gres River in Iosco County, Michigan. The type of food used was not stated.

Parker, during 1953, 1954, and 1955 fed ground freshwater fish in the impoundment behind the More Trout, Inc., dam located on the East Branch of the Au Gres River. The results of Parker's feeding program have not as yet been fully determined.

If anyone is to demonstrate beyond reasonable doubt that artificial feeding is a feasible method of trout stream management, the experimental site must be as rigidly controlled as possible. Extraneous variables which might influence the final interpretations of the results must be eliminated.

Following completion of the bulkheads and fish-traps on the experimental waters of the Hunt Creek Fisheries Experiment Station in 1949, a site which met almost all requirements for a feeding experiment was provided by Section Z, the lowermost of the experimental sections (see map, Fig. 1). Section Z is 2,397 feet long and has an area of 1.12 acres. During the feeding experiment, the weir and fish traps at the lower boundary of Section Z permitted a tally of the fish migrating through the lower end; the absence of a weir at the upper end of the

section made it impossible to determine fish movements between Section Z and connecting, upstream sections.

Prior records were available concerning the anglers' catches for the period 1949-1951, as well as population estimate data. A good series of scale samples from the angler-caught fish, from which changes in growth might be detected, was available for the 1951 trout season.

The increased availability of dried pelleted fish foods in 1951 gave the work some impetus. Prior to 1951, these foods were not generally obtainable and any such experimentation was partially dependent on refrigerated storage facilities for fresh or frozen meat and fish products then commonly in use.

It did not appear likely that addition of food to Section Z could have any effect on the other experimental sections, inasmuch as Section Z is the lowermost of the experimental waters. Also, there were no experiments in progress at that time in Section Z with which test feeding might conflict. All circumstances combined to make 1952 a favorable season for this experiment.

The food chosen was Head Tide, a commercial product manufactured by the Head Tide Fish Feed Company of Southport, Maine. The product is a dry, pelleted mixture commonly supplied in 100-pound bags; it did not deteriorate in storage for the comparatively limited time of the experiment. Head Tide is said to consist mainly of ground-up marine fish. The formula was not furnished by the manufacturer.

Pellets were cylindrical in shape and of two sizes. The smaller were approximately one-eighth inch in diameter by three-sixteenths inch long, while the larger pellets were about three-sixteenths by five-sixteenths inch. The larger pellets were fed from April 15 to July 1;

the smaller pellets were used during the period July 14 to September 12. The change in pellet size was due to the availibility of the two sizes at the time, and is not thought th have influenced the experimental results.

According to instructions furnished by the Head Tide Company, best results were to be obtained by feeding according to weight of fish present, and prevailing water temperature. We utilized the September, 1951, population estimate to calculate the probable weight of fish in Section Z at the start of feeding in April, 1952. The calculated weight of trout present in September, 1951, was adjusted by adding 25 per cent as a safety factor to ensure an adequate ration. This gave 75 pounds of trout as a base figure for computing the ration. Observed water temperatures from weir records provided the other information needed to calculate the ration.

The calculated ration for a week was divided by the number of days during which staff members could spend time in feeding operations. If a scheduled day was missed, the ration was doubled at the next feeding. Daily rations were weighed to the nearest one-tenth pound on a Chatillon spring scale (40-pound capacity), and carried to the stream in a pail. Pellets were scattered by hand over the upper one-half of the section on one day, and over the lower one-half of the section on the following feeding date.

Only on one occasion did any staff member observe a trout feeding on the pellets when they were tossed into the stream. The usual reaction of any wild trout within the vision of the feeder was to scurry for cover when the food was thrown on the water. The pellets usually sank to the bottom within twenty yards. General observations with water of

various temperatures suggested that complete disintegration of the pellets took place within about two minutes.

Head Tide pellets were fed in Section Z on 90 different days between April 15 and September 12, 1952. Feeding was started eleven days ahead of the opening date of trout season, in an attempt to take advantage of rising water temperatures. The dates of feeding and the amounts of food dispensed are listed in Table I. A total of 393.9 pounds of Head Tide was used; this amounted to 351.7 pounds per acre of stream surface. Daily rations varied between 1.5 and 10.0 pounds.

The possible favorable effects which might be expected to result from supplementary feeding are:

1. An increase in the number of fish creeled resulting from increased growth and/or survival of fish which would not have grown or survived from sublegal class (less than 7 inches) during the current season.
2. An increase in the average size of the fish creeled.
3. A change in the size composition of the fall population resulting from greater annual increment.
4. An increase in the robustness of Section Z fish during 1952 over that noted in 1951, as measured by the condition factor, C.

Sections A, B, C, and D, located upstream, which were not fed, served as controls. It can be reasoned that if feeding alone had been responsible for any changes noted, favorable changes should have occurred during 1952 in Section Z only, and not in the other sections. Although it might be argued that the absence of any barrier between sections Z and A would have allowed free movement back and forth between the two sections, tag recoveries from wild adult trout marked in the

various stream sections indicate that there was only a small amount of movement from Section Z to Section A, and a somewhat greater amount from Section A to Section Z. The question of migration between the sections is discussed later in some detail.

Angling statistics

Comparative angling statistics for the experimental sections of Hunt Creek, for the period 1950-1954, are given in Table II. A noticeable increase in total catch occurred in Section Z in 1952 (from 124 wild brook trout in 1951 to 222 wild brook trout in 1952). However, sections A, C, and D also exhibited increases in total catch between 1951 and 1952, without any feeding; while the catch in Section B declined slightly.

Angling quality as measured by the simple catch per hour was influenced by widely varying angling pressure in 1951 and 1952. Catch-per-hour indices suggest no increase in quality in Section Z between the 1951 and 1952 seasons, but indicate slightly better fishing in sections A, C, and D in 1952 than in 1951. Also the percentage of successful anglers increased less in Section Z, from 1951 to 1952, than in all of the other experimental sections.

Inspection of the graph (Fig. 2) of the catch per hour for the various sections reveals that the trend of angling quality in all sections was very similar during the three-year period 1951-1953. Angling quality either rose in 1952 as compared to 1951 or remained about the same, but dropped noticeably in 1953. This 1953 decline took place in Section Z despite the feeding in 1952.

Population studies

Did feeding during 1952 bring about changes in the size composition of the fall population that might be attributed to extra growth? Table III provides some data on this question. This tabulation lists the actual numbers of wild brook trout captured once in the two runs made during the course of the 1951 and 1952 population studies in sections Z, A, B, and C. Increases, many of them substantial, were noted during 1952 in a majority of the one-inch size classes of Section Z. However, increases also were recorded in sections above Z. This situation suggests strongly that feeding was not responsible for the changes observed.

Combining age data and population study figures, the calculated age and size distributions of the estimated trout population in Section Z at the close of the 1951 and 1952 trout seasons are given in Table IV. The age distribution of trout in the anglers' catch in those years is shown at the bottom of the table. From this listing it can be shown that the fall population, numerically, was very much the same in both years, despite the difference in the anglers' catches in those years (1,287 in 1951; 1,210 in 1952).

Conceivably, migration out of, or into, Section Z could have influenced the interpretation of the population data. The numbers of wild brook trout which moved downstream out of, and upstream into, Section Z during 1951 and 1952 are given in Table V. The summary indicates that the net loss by migration to the experimental sections as a whole was 1,204 brook trout in 1951, and 1,067 in 1952. Just what portion of this loss originated in Section Z cannot be determined.

If it is assumed that the same proportion of the migrants listed above originated in Section Z in both years, there is still little difference in the 1951 and 1952 populations, and the larger population was present in 1951.

Since movement between the various sections could have influenced the results of the creel census and the population studies, this question also was examined in some detail. Table VI summarizes the movement tendencies of wild adult brook trout (larger than 7.0 inches at marking). The data consist of fish marked during the fall population studies and recovered during the period 1945-1953. Recoveries were obtained both by electric shocker and by angling.

Only fish marked in the population studies were utilized in this analysis because it was felt that such fish were a better sample of the population, in that they were captured, tagged, and released at or near their home site.

Of 1,080 fish tagged, 566 (or 52.4 per cent) were later recovered. Of the 566 recoveries, 478 (84.5 per cent) were recaptured in the section where they were tagged.

More specifically, of the 210 wild brook trout tagged in Section Z, 124 were recovered--95.2 per cent in Section Z. For the remaining sections, the percentages of the recaptures of fish tagged and retaken in the same sections were: A, 74.0 per cent; B, 55.4 per cent; C, 87.9 per cent; D, 94.5 per cent.

The distribution of the recoveries suggests that the adult brook trout populations of sections Z, C, and D were relatively stable, whereas those of sections A and B tended to move in both directions.

Assuming that the general inter-section movement pattern as presented in Table VI held true during 1952, it can be hypothesized that

there was probably more movement during 1952 from sections A and B into Section Z than in the reverse direction, and that a portion of the increase in the 1952 Section Z catch must be attributed to movement from sections lying upstream. Likewise a small portion of the Section A catch during 1952 very probably was the result of downstream movement from sections B and C.

Coefficient of condition (C)

The comparison of coefficients of condition of angler-caught brook trout from Section Z (fed) and Section A (unfed) for the years 1951 and 1952 is found in Table VII, which lists average measurements and average C values. With the exception of June-caught fish from Section A (which were in better condition in 1952), the differences noted in the average C values between 1951 and 1952 were not of any statistical significance (P values ranged from 5.6 to 82.0 per cent).

Condition indices of shocker-caught brook trout from Section Z in 1952 were compared with brook trout taken by shocker from adjacent waters immediately below Section Z in 1951 by E. L. Cooper. These collections were separated into two size groups--above and below 7.0 inches (Table VIII). The differences found between 1951 and 1952 were non-significant (P values ranged between 22.8 and 87.1 per cent). As described earlier, a larger sample of angler-caught fish of the same size range in the same month exhibited little difference in average C values in the two years compared.

Growth as determined from scale collections

Scales were available from two sources- collections made during the September population studies of 1951 and 1952 (Table IX), and

angler-caught fish taken during those two trout seasons (Table X). The scales were mounted in glycerin-gelatin and read under a microprojector at a magnification of 104 diameters. Measurements on the scale image were made from the focus to each annulus and to the edge of the scale. A nomograph of the type described by Hile (1950) expedited growth calculations. The measured intervals on the movable nomograph arm were determined from the body-scale ratio for Hunt Creek brook trout, which was found earlier to be $L = 0.896871\ s^{0.854557}$. These values were determined from scale collections made during the periods 1940-1946 by Dr. E. L. Cooper. Since they were taken from stream sections dealt with in the present study, and since these areas have not changed radically in physical character, it is assumed that the growth characteristics of the brook trout populations have not changed appreciably.

In Table IX the average calculated growth of shocker-caught brook trout, during 1951 and 1952, is compared by age group and stream section. The statistical significance of the differences were determined by means of the t test. Rather limited collections of young-of-the-year suggest that the 0-age-group fish grew about as well during 1951 in Section Z as during 1952. In Section C the t test indicates much better growth for 1951. No young fish are available from Section A for either year, and only are from Section B in 1951.

For age-group-I fish, 1952 was significantly better than 1951 in both Z and A, but differences between years were non-significant for sections B and C. Among age-group-II brook trout, growth differences for all sections between 1951 and 1952 were non-significant. Age-group-III brook trout were relatively rare in the fall sampling.

Comparisons of average calculated growth during 1952 were made between the shocker-caught fish of Section Z and the same age groups

from other sections. Section Z fish in age group I grew significantly more than did Section B fish in age group I, but the differences in growth for I's from sections A, C, and Z were non-significant, as were the differences for age-group-II fish from all sections (Table XI).

Similar comparisons were made for the angler-caught brook trout from all sections for 1951 and 1952 (Table X). These averages represent only the growth from the time of annulus formation until the time of capture during the trout season (in contrast to the shocker-collected specimens taken during the period September-November which show the entire season's growth).

Age-group-I fish are not taken in large numbers by angling, as relatively few Hunt Creek fish reach the legal size of 7 inches during their second summer of life. Only for Section C was there any statistical significance between the 1951 and 1952 average growth. For all other sections the differences noted between years in average growth were non-significant. Exactly the same situation applied to age-group-II fish--there were non-significant differences between years in sections Z, A, and B; and 1951 was significantly better than 1952 in Section C.

Among age-group-III fish average growth differences between years were non-significant for sections Z and B. The significant differences between 1951 and 1952, for sections A and C, likely resulted because most of the specimens for 1951 were collected early in the season before any growth had taken place.

Again, comparing Section Z with sections A, B, and C, for the 1952 growth data from angler-caught fish, it can be demonstrated (Table XI) that there were non-significant differences in average growth among age-group-I fish from all sections. Among age-group-II fish average growth was significantly better in A than in Z; the differences between Z, B, and C were non-significant. For the age-group-III fish, average growth was better in A than in Z, better in Z than in C, and Z was no better than B. Again, the analysis of this age group was confused by the fact that some of the fish were captured earlier in the season than were others.

Neither from the angler-caught nor the shocker-collected scales could any evidence be found that 1952 growth of Section Z brook trout was consistently any better than 1951 growth; nor could it be shown that the 1952 growth of Section Z fish was any better than growth of fish in sections lying upstream which did not receive additional food during that year.

Discussion

A comparison of the 1951 and 1952 seasons for Section Z from the standpoint of angling quality, coefficient of condition, residual fall population, and growth (as determined from scale and body measurements) indicates strongly that the feeding in Section Z brought about no significant increases in growth or survival as the result of the feeding.

The increase in the total catch of Section Z during 1952 over 1951 was paralleled, although not equalled, in sections A, C, and D--all unfed sections lying upstream. The increase in the 1952 catch in Section Z appears to have been the result of increased angling pressure combined with a larger available number of age-group-II and age-group-III brook trout (see Tables IV and X). The same situation as regards the availability of the II's and III's apparently held true for Section A; they increased slightly in Section C, decreased slightly in Section B. Why these two age-groups survived in greater numbers to the 1952 season than to the 1951 season is not now apparent. The numerical increase of these fish in the anglers' catch of Section Z cannot be attributed to the feeding program since they were present in the stream before feeding was started.

This experiment in feeding a portion of a trout stream should not be taken to indicate that stream feeding with this or other foods

cannot be done successfully. Other foods and/or other techniques of feeding might accomplish the desired aims. Studies by Willoughby (1953), Wolf (1953), and Brockway (1953) have shown that the pellet type of food when properly used can grow trout very well under hatchery conditions.

Whether financial considerations would permit a public agency to engage in stream feeding, if eventually proven sucessful, remains to be determined. The distribution costs of an extensive stream feeding program at recommended frequencies could very easily offset any possible advantages gained over present management techniques.

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Table I.

Schedule of feeding Head Tide Pellets to brook trout in Section Z, Hunt Creek, 1952 [1]

Date	Pellets fed (lbs.)	Date	Pellets fed (lbs.)	Date	Pellets fed (lbs.)	
April		June		Aug.		
15	1.5	17	5.0	18	5.0	
16	1.5	18	5.0	19	3.0	
17	2.1	19	4.0	20	3.0	
18	1.5	20	4.0	21	3.0	
21	2.4	25	4.0	22	3.0	
24	3.2	26	5.0	23	3.0	
25	2.5	27	5.0	26	5.0	
28	4.5	28	5.0	27	5.0	
29	1.6	30	5.0	28	5.0	
30	2.0			29	3.0	
		July		30	3.0	
May		1	5.0			
2	3.4		183.8	Sept.		
3	1.7			3	4.0	
7	3.2			4	2.0	Screenings
8	3.3	July		5	3.0	"
9	3.7	14	5.0	6	2.0	"
13	3.6	16	10.0	7	2.0	"
14	3.6	19	10.0	9	3.0	"
15	2.9	20	5.0	12	3.1	"
16	1.9	23	10.0		210.1	
17	1.9	24	5.0			
21	4.3	25	5.0	Total pounds fed April 15-Sept. 12 = 393.9		
22	4.3	27	10.0			
23	2.0	29	10.0			
24	2.0	30	5.0			
27	3.4	31	5.0			
29	3.4					
30	3.4	Aug.				
		1	5.0			
June		2	5.0			
4	5.0	4	10.0			
5	5.0	5	5.0			
6	7.0	6	5.0			
7	5.0	7	5.0			
9	5.0	8	5.0			
10	6.0	9	5.0			
11	6.0	12	9.0			
12	6.0	13	6.0			
13	6.0	14	3.0			
14	6.0	15	3.0			
16	5.0	16	4.0			

[1] Large pellets fed from April 15 to July 1. Smaller (fingerling size) pellets fed from July 14 to September 12.

Table II

Angling statistics for wild brook trout, Hunt Creek,
1950-1954 inclusive

Numbers in carets (^) indicate numbers of legal trout creeled which were not weighed.

Year and section	Total number of			Anglers' catch			
	Fishing trips	Successful trips	Fishing hours	Number	Pounds	Catch per hour	Average length (in.)
Section Z							
1950	164	61 (37)	473	161[1]	21	0.34	7.4
1951	129	49 (37)	322	124	18	0.39	7.5
1952	188	80 (42)	570	222	34	0.39	7.7
1953	225	105 (47)	566	183	26	0.32	7.6
1954	363	128 (35)	838	143	22	0.17	7.7
Section A							
1950	62	26 (42)	132	101[13]	14	0.77	7.4
1951	87	34 (39)	188	83	13	0.48	7.5
1952	73	43 (59)	205	131	19	0.64	7.6
1953	101	49 (49)	261	126	19	0.48	7.7
1954	172	73 (42)	438	150	21	0.34	7.5
Section B							
1950	21	5 (24)	33	10	2	0.30	7.9
1951	65	20 (31)	79	38	6	0.48	7.5
1952	31	14 (45)	59	28	4	0.48	7.6
1953	28	9 (32)	39	16	2	0.41	7.5
1954	73	29 (40)	121	32	5	0.26	7.7
Section C							
1950	104	49 (47)	252	59	9	0.23	7.6
1951	167	57 (34)	299	104	16	0.35	7.6
1952	143	47 (33)	329	134	20	0.41	7.6
1953	210	73 (35)	438	93	15	0.21	7.9
1954	204	85 (42)	452	102	16	0.23	7.7
Section D							
1950	182	89 (49)	498	247	51	0.50	8.2
1951	233	80 (34)	500	206	43	0.41	8.4
1952	241	97 (40)	602	263	59	0.44	8.5
1953	317	155 (49)	849	337	82	0.40	8.8
1954	299	94 (31)	638	199	46	0.31	8.6

Table III

Actual numbers and sizes of wild brook trout captured once during the 1951 and 1952 September population studies in sections Z, A, B and C, Hunt Creek

Length class (inches)	Section Z			Section A			Section B			Section C		
	1951	1952	Percentage change	1951	1952	Percentage change	1951	1952	Percentage change	1951	1952	Percentage change
2.0-2.9	20	23	15	272	478	76	146	286	96	406	630	55
3.0-3.9	211	343	63	296	741	150	117	220	88	483	629	30
4.0-4.9	140	186	33	198	235	19	98	120	22	140	238	70
5.0-5.9	230	216	-6	161	225	40	52	100	92	168	236	40
6.0-6.9	97	124	28	87	100	20	24	38	58	74	85	15
7.0-7.9	43	39	-9	25	34	36	15	19	27	20	37	85
8.0-8.9	14	19	36	5	13	160	1	3	200	7	15	114
9.0-9.9	2	4	100	1	2	100	3	...	-100	2	5	150
10.0-10.9	1	...	-100	1	1	0	...	...	...	3	...	-100
11.0-11.9	...	1	100	1	...	-100	1	...	-100	...	...	...
Totals	758	955	26	1,047	1,829	75	457	786	62	1,303	1,875	44
2.0-6.9	698	892	28	1,014	1,779	75	438	764	74	1,271	1,818	43
over 7.0	60	63	5	33	50	52	19	22	16	32	57	78

Table IV

Age and size distributions of brook trout in Section Z, Hunt Creek, September population studies, 1951 and 1952

Size range	1951 Age group 0	I	II	III	Total	1952 Age group 0	I	II	III	Totals
0.0-3.9	509				509	442	111			553
4.0-4.9	63	157			220	183	21			204
5.0-5.9		327	16		343		203	36		239
6.0-6.9		103	35		138		96	38		134
7.0-7.9							2	47		49
8.0-8.9			64	13	77		2	10	7	19
9.0-9.9									7	7
Over 10.0									5	5
Total	572	587	115	13	1,287	625	435	131	19	1,210
Anglers' Catch		8	92	18	118[1]		9	168	57	234[1]
Grand Total	572	595	207	31	1,405	625	444	299	76	1,444

[1] Not including samples in which scales could not be aged, and includes sublegal trout creeled. Four age-group-IV trout not included.

Table V

Summary of migration of brook trout through the downstream boundary of Section Z of Hunt Creek via the weir fish traps.

Upstream traps not in continuous operation in 1951 and 1952

Date, 1951	Length range, inches							Total number
	1.0 - 1.9	2.0 - 2.9	3.0 - 3.9	4.0 - 4.9	5.0 - 5.9	6.0 - 6.9	7.0+	
Downstream								
Jan. 1 - Jan. 31	0	4	8	0	1	1	1	15
Feb. 1 - Feb. 28	0	1	4	3	0	1	0	9
March 1 - April 4	0	0	4	4	5	0	0	13
April 5 - May 2	4	2	30	53	20	5	1	115
May 3 - June 6	7	3	74	96	27	8	18	233
June 7 - July 4	48	30	20	18	7	7	7	137
July 5 - Aug. 1	20	75	6	18	7	4	23	153
Aug. 2 - Sept. 5	2	50	5	7	3	3	1	71
Sept. 6 - Oct. 3	1	18	46	36	32	14	10	157
Oct. 4 - Nov. 7	0	14	71	56	83	43	18	285
Nov. 8 - Dec. 5	0	19	15	16	9	4	13	76
Dec. 6 - Dec. 31	0	15	11	1	3	2	6	38
Total	82	231	294	308	197	92	98	1,302
Upstream								
April 26 - June 6	0	0	1	6	2	1	0	10
June 14 - July 4	0	3	0	2	6	0	1	12
July 5 - July 25	0	3	1	7	14	3	3	31
Aug. 2 - Aug. 29	0	0	1	0	4	0	1	6
Sept. 6 - Oct. 3	0	0	0	1	4	10	8	23
Oct. 4 - Oct. 31	0	0	0	0	3	10	3	16
Total	0	6	3	16	33	24	16	98
1952								
Downstream								
Jan. 1 - Feb. 7	0	7	8	4	1	1	1	22
Feb. 8 - March 6	0	1	2	1	2	1	3	10
March 7 - April 3	0	0	6	0	6	0	1	13
April 4 - May 1	3	2	54	40	24	12	6	141
May 2 - June 5	16	0	67	123	26	12	1	245
June 6 - July 3	27	15	8	29	10	4	6	99
July 4 - Aug. 7	4	20	3	5	9	1	8	50
Aug. 8 - Sept. 4	0	6	5	0	0	0	9	20
Sept. 5 - Oct. 2	0	4	30	26	10	6	2	78
Oct. 3 - Nov. 6	0	4	8	18	37	20	12	99
Nov. 7 - Dec. 4	0	34	39	54	53	30	13	223
Dec. 5 - Dec. 31	0	34	29	13	13	2	3	94
Total	50	127	259	373	191	89	65	1,094
Upstream								
April 15 - Oct. 16	0	0	0	0	1	2	9	12
Oct. 17 - Nov. 20	0	0	0	0	3	6	6	15
Total	0	0	0	0	4	8	15	27

Table VI

Movement of wild adult brook trout between sections, Hunt Creek, 1945-1953 data combined

Numbers of recoveries are given in parentheses

Where tagged	Total marked	Total recovered	Percentage of total recovered in section					
			Below Z	Z	A	B	C	D
Section Z	210	124	1.6 (2)	95.2 (118)	2.4 (3)	...	0.8 (1)	...
Section A	270	127	...	15.7 (20)	74.0 (94)	7.9 (10)	1.6 (2)	0.8 (1)
Section B	111	56	1.8 (1)	12.5 (7)	10.7 (6)	55.4 (31)	12.5 (7)	7.1 (4)
Section C	270	149	0.7 (1)	2.7 (4)	0.7 (1)	2.0 (3)	87.9 (131)	6.0 (9)
Section D	219	110	...	...	...	0.9 (1)	4.6 (5)	94.5 (104)
Totals[1]	1,080	566	... (0/4)	79.2 (118/149)	90.3 (94/104)	68.9 (31/45)	89.7 (131/146)	88.1 (104/118)

[1] Percentage figures given here show, for all fish recovered in a section, the ratio between the ones which had been marked in that section and the ones which had been marked in other sections.

Table VII

Summary of condition (C) of angler-caught brook trout from sections Z and A, Hunt Creek, 1951 and 1952. All samples are of wild brook trout from 7.0 to 7.9 inches in length

Date	Section	Sample number	Average Length (inches)	Average Weight (pounds)	Average C	Std. error	Percentage[1] chance (t test)
April - May							
1951	Z	44	7.4	0.13	32.8	0.443	19.7
1952	Z	31	7.4	0.13	33.1	0.789	
1951	A	17	7.3	0.13	33.3	0.896	82.0
1952	A	8	7.4	0.13	31.0	1.377	
June							
1951	Z	13	7.3	0.13	33.6	0.616	75.8
1952	Z	30	7.4	0.14	34.5	0.472	
1951	A	15	7.4	0.14	34.1	0.620	97.4
1952	A	17	7.3	0.14	36.9	1.009	
July							
1951	Z	7	7.3	0.14	34.6	1.419	12.7
1952	Z	39	7.4	0.14	34.8	0.414	
1951	A	20	7.4	0.14	33.3	0.504	68.7
1952	A	24	7.4	0.14	34.0	0.425	
Aug. - Sept.							
1951	Z	15	7.4	0.14	34.0	0.766	5.6
1952	Z	34	7.4	0.14	33.9	0.490	
1951	A	16	7.4	0.14	33.8	0.500	52.2
1952	A	30	7.4	0.13	33.2	0.545	

[1] Percentage chance that the two averages are significantly different.

Table VIII

Summary of condition (C) of shocker-caught brook trout from Section Z and the stream area immediately below Section Z, Hunt Creek, 1951 and 1952

Date	Size range	Sample number	Average Length (inches)	Average Weight (pounds)	Average C	Standard error	Percentage [1] chance (t test)
May							
1951	5.0-6.9	42	5.9	0.076	35.9	0.388	87.1
1952	3.0-6.9	164	5.0	0.051	36.5	0.0709	
1951	7.0+	11	7.7	0.162	35.7	0.769	93.7
1952	7.0+	13	7.6	0.169	38.0	0.874	
June							
1951	5.0-6.9	74	5.9	0.077	35.9	0.351	78.5
1952	3.0-6.9	225	5.4	0.060	36.4	0.197	
1951	7.0+	14	7.6	0.167	38.0	1.188	45.1
1952	7.0+	37	7.4	0.161	38.8	0.594	
Aug.							
1951	5.0-6.9	29	5.9	0.078	36.4	0.515	59.9
1952	3.0-6.9	80	5.6	0.069	35.9	0.298	
1951	7.0+	8	7.7	0.184	39.0	1.556	22.8
1952	7.0+	13	7.8	0.184	38.5	0.746	
Sept.-Oct.							
1951	4.0-6.9	150	5.6	0.064	34.5	0.358	76.2
1952	3.0-6.9	104	5.6	0.068	35.1	0.360	
1951	7.0+	22	8.0	0.183	36.6	1.019	48.4
1952	7.0+	19	7.7	0.175	37.4	0.699	

[1] Percentage chance that the two averages are significantly different.

Table IX

Comparison of estimated growth of shocker-caught brook trout from experimental sections of Hunt Creek, September population samples, 1951 and 1952

	Year and section	Age group	Sample number	Average growth (inches)	Standard error	Percentage chance (t test) [1]
Z	1951	0	7	4.00	0.079	08.0
	1952	0	25	3.99	0.061	
	1951	I	45	2.09	0.074	95.6
	1952	I	33	2.43	0.144	
	1951	II	11	1.72	0.183	82.9
	1952	II	32	2.01	0.104	
A	1951	I	35	1.85	0.097	97.8
	1952	I	39	2.27	0.111	
	1951	II	31	1.57	0.096	94.5
	1952	II	22	1.85	0.109	
B	1951	0	1	4.90	0.0	...
	1952	0	10	3.23	0.060	
	1951	I	31	2.07	0.162	18.2
	1952	I	37	2.03	0.080	
	1951	II	7	1.83	0.065	58.8
	1952	II	17	1.94	0.118	
	1951	III	1	3.60	0.0	...
	1952	III	3	1.27	0.319	
C	1951	0	14	3.96	0.076	99.9+
	1952	0	21	3.40	0.059	
	1951	I	69	2.30	0.064	18.4
	1952	I	94	2.32	0.057	
	1951	II	9	1.77	0.263	43.1
	1952	II	49	1.93	0.098	
	1951	III	3	1.53	0.394	...
	1952	III	3	1.77	0.376	

[1] Percentage chance that the two averages are significantly different.

Table X

Comparison of estimated growth of angler-caught brook trout from sections Z, A, B, and C of Hunt Creek, 1951 and 1952

Year and section	Age group	Number of scales	Average growth (inches)	Standard error	Percentage[3] chance (t test)	Year and section	Age group	Number of scales	Average growth (inches)	Standard error	Percentage[3] chance (t test)
Z 1951	I	8	2.55	0.159	81.6	B 1951	I	2	3.25	0.346	78.9
1952	I	9	2.88	0.189		1952	I	2	2.80	0.100	
1951	II	92	1.56	0.068	79.2	1951	II	26	1.62	0.164	89.3
1952	II	168	1.67	0.055		1952	II	16	1.98	0.153	
1951	III	18	0.80	0.100	87.6	1951	III	7	0.60	0.160	7.2
1952	III	57	1.01	0.092		1952	III	3	0.57	0.297	
1951	IV	0	...	...	...						
1952	IV	2	...	...	...						
A 1951	I	5	2.76	0.240	88.8	C 1951	I	2	3.40	0.100	99.9+
1952	I	2	3.50	0.400		1952	I	13	2.78	0.162	
1951	II	67	1.78	0.069	52.8	1951	II	42	2.03	0.087	95.7
1952	II	91	1.85	0.069		1952	II	46	1.71	0.126	
1951	III	6[1]	0.00	0.000	99.9+	1951	III	7	1.50	0.160	99.9+
1952	III	35	1.64	0.092		1952	III	13[2]	0.28	0.130	
1951	IV	0	...	...	...						
1952	IV	2	...	...	...						

[1] All fish taken before May 7, 1951 before any growth occurred.

[2] 9 fish taken before May 7, 1952 before any growth occurred.

[3] Percentage chance that the two averages are significantly different.

Table XI

P values for comparison of growth of Section Z fish for 1952 with fish from other sections

The values given are percentage chance that the average growth was significantly different

Underlined values were significant in favor of Section Z

Age group	Section	Compared with section					
		A		B		C	
		Shocker-caught	Angler-caught	Shocker-caught	Angler-caught	Shocker-caught	Angler-caught
I	Z	62.1	83.8	<u>97.6</u>	28.8	52.2	31.1
II	Z	70.8	95.4	34.7	94.8	42.4	22.8
III	Z	...	99.9	...	91.8	...	<u>99.9</u>

Fig. 1. Map of Hunt Creek experimental waters, showing Section Z where artificial feeding test was done.

Figure 1

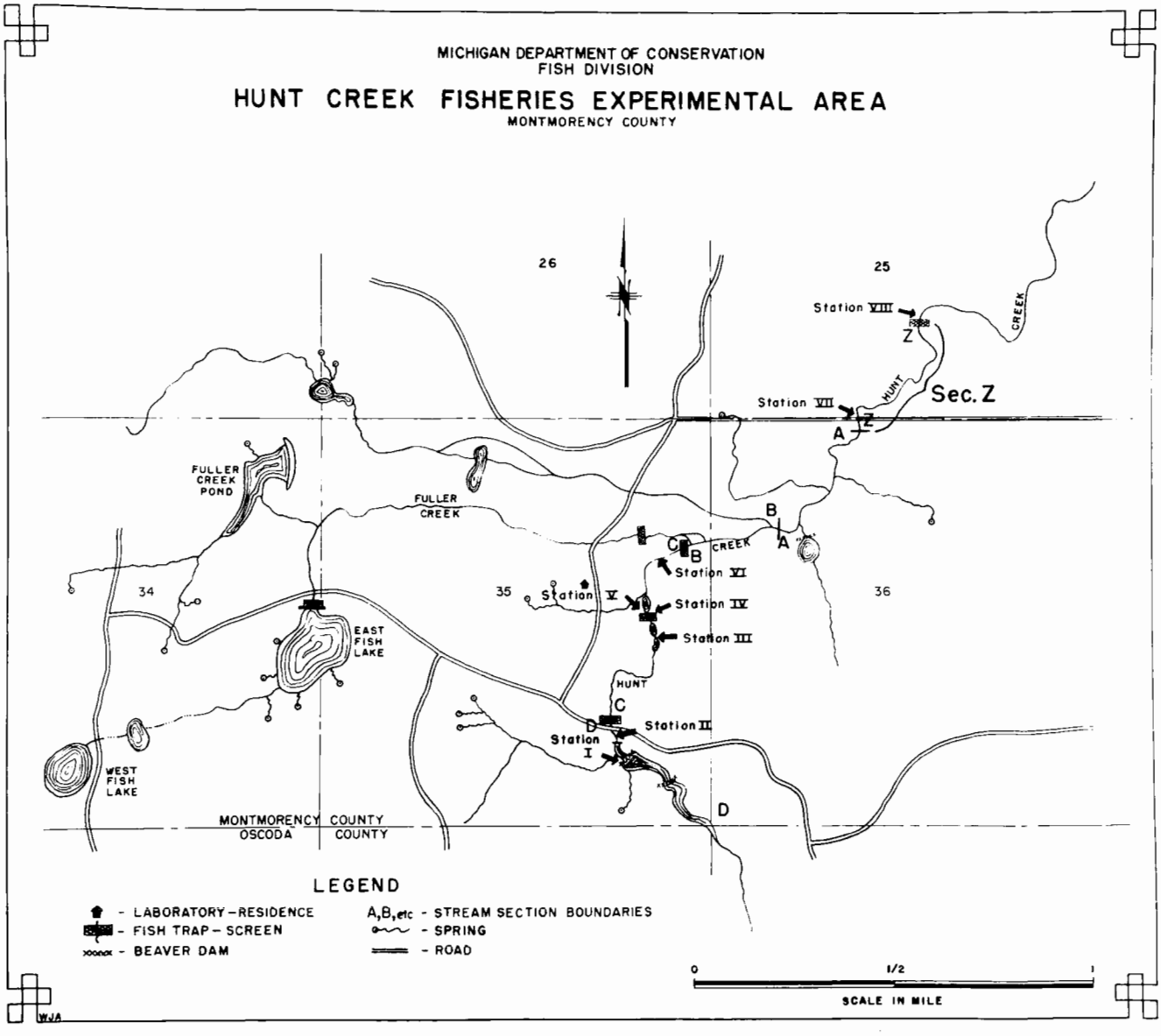
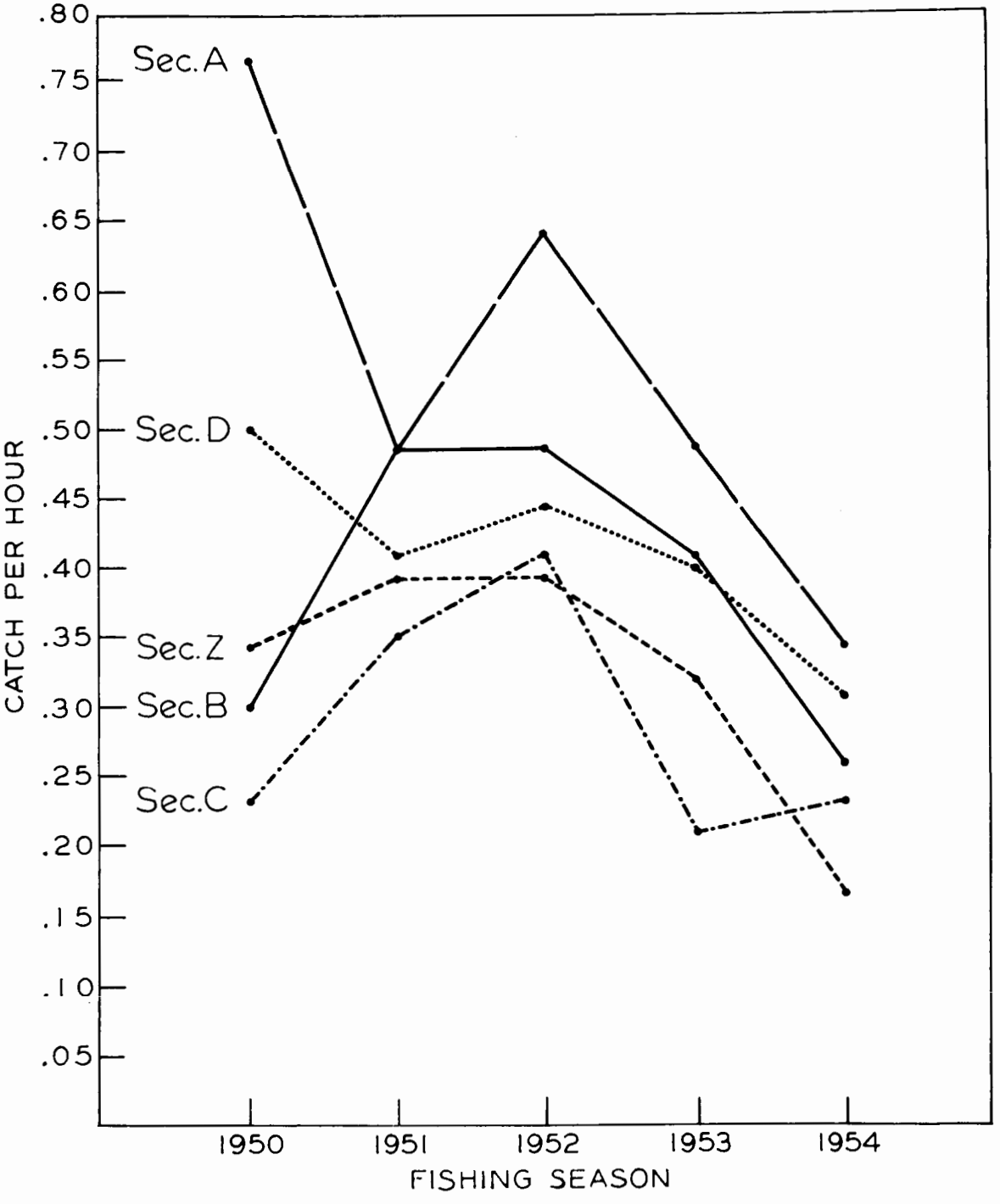

MICHIGAN DEPARTMENT OF CONSERVATION
FISH DIVISION
HUNT CREEK FISHERIES EXPERIMENTAL AREA
MONTMORENCY COUNTY
26
25
Station VIII
Z
CREEK
HUNT
Station VII
Sec. Z
A
FULLER CREEK POND
FULLER CREEK
B
C
B
CREEK
A
Station VI
34
35
Station V
Station IV
36
Station III
EAST FISH LAKE
HUNT
C
D
Station II
Station I
WEST FISH LAKE
MONTMORENCY COUNTY
OSCODA COUNTY
D
LEGEND
- LABORATORY-RESIDENCE
- FISH TRAP- SCREEN
- BEAVER DAM
A,B,etc - STREAM SECTION BOUNDARIES
- SPRING
- ROAD
0
1/2
1
SCALE IN MILE
WJA

Fig. 2. Catch per hour of wild brook trout in the various experimental sections of Hunt Creek, 1950-1954.

Figure 2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CATCH PER HOUR
Sec.A
Sec.D
Sec.Z
Sec.B
Sec.C
1950
1951
1952
1953
1954
FISHING SEASON