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THE ANGLERS' CATCH FROM PORTIONS OF CERTAIN MICHIGAN TROUT
STREAMS IN 1939 and 1940,
WITH A DISCUSSION OF INDICES TO ANGLING QUALITY

Contribution from the Institute for Fisheries Research of
the Michigan Department of Conservation.

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In most fish yield studies so far reported it has been impossible to calculate the catch in pounds per unit of effort or per unit of water area because the fish were not weighed. There were two good reasons for omitting weights. Much of the early creel census was by relief labor which could not always be depended upon to take accurate measurements, hence the simpler the data required the more reliable would be the information. Also, in lakes particularly, there is usually a last-minute rush of anglers to check in their catches which further necessitated simple records.

In 1939 and in 1940 crews of C. C. C. enrollees were carefully selected and trained in their duties in advance of the fishing

season. Where this help was not available, qualified creel census clerks were hired by the Conservation Department. In all instances the work was carefully supervised. Intensive creel censuses of this type were limited to short sections of seven trout streams in 1939 and to five in 1940. Enough men were used so that all of the information required could be obtained without inconveniencing the anglers.

Delay in arrival of balances prevented weighing the catches until June 15, 1939, after which weights were secured with few exceptions. Prior to that date nearly all of the fish were measured individually. In a few cases on all streams, weights could not be taken because fishermen disregarded the signs asking them not to clean their fish before they had been checked. Rarely, anglers were seen but not contacted by the clerks. The probable catch of these anglers was estimated assuming them to have been average for that period.

In order to make the final figures on yield as complete and as accurate as possible the following procedure was employed. Weight-length curves for each species and for each stream were prepared from all fish which were weighed and measured. From these curves the weights of fish of known lengths could be closely approximated. If only the number of fish caught by an angler were known, the average length for each species for the two-week period involved was used and the corresponding weights on the curves

assigned to this catch. The take of anglers seen but not contacted was considered average in all respects for the period and were also added to the known total.

Sources of error in the calculated yields may be present due to inaccurate measurements of the fish, variation in the weight-length relationship of trout during the fishing season and to estimates of the catch of anglers not contacted. However, the errors are to some extent compensating and were present on each stream so that results should be reasonably accurate and comparable.

Measurements of the area of the sections under census were determined either from plane-table maps or by chaining the length and width.

Yield to the Anglers

Tarswell (1938) reported the yield of rainbow trout in Yonto and Horton Creeks, Arizona as from 29.5 to 54.2 pounds per acre in 1936 and 1937 with an angling pressure varying from 125 to 241 man-hours per acre per season. What percentage consisted of hatchery trout is not stated but some planting was done in both streams possibly with legal-sized fish. In determining the natural production of a stream the weight of planted hatchery trout caught should be deducted from the total poundage recorded. Tarswell's figures may therefore be too high.

From data published by Surber (1940) it may be calculated that the yield per acre of brook and rainbow trout in 1938 and 1939 in the St. Mary River, Virginia was 7.55 pounds and 9.64 pounds, respectively.

Angling pressures varied from 103 to 130 man-hours per acre per season. Hatchery fish were planted as advanced fingerlings from 3.75 to 6.00 inches in length during late summer and fall in the years 1935, 1936, and 1938. Since they were in the stream at least one year before entering the catch their contribution to the poundage produced may be considered as production by the stream.

In 1939, the total yield from sections of seven Michigan trout streams was 15.7 pounds per acre (Table 1.). Considerable variation is evident. The most productive in pounds per acre was the White River (30.6) followed by the Pine River (26.4), Hunt Creek (15.6), the Little Manistee River (14.1), the North Branch of the Au Sable River (12.3), the Pigeon River (11.1) and Canada Creek (3.2)

In 1940 sections of only five streams were covered by intensive creel censuses because of a reduction of C. C. C. man power. The total yield from the sections was 15.3 pounds per acre. Again, yields varied greatly in different waters. The highest in pounds of legal trout removed per acre of water under census was from the Fishdam River (68.3) followed in order by the East Branch of the Tahquamenon River (27.4), Hunt Creek (12.8), North Branch of the Au Sable (10.6) and the White River (8.5). The marked difference in the yield recorded for the White River in 1940 over 1939 was the result of a change in location of the section censused.

Calculations of the yield of "wild" trout (net yield) were possible because all hatchery-reared trout present in the stream section under census were either jaw-tagged or finclipped, or the percentage of hatchery fish in the catch could be estimated, based upon the returns from previous plantings on many of these same streams,

(Shetter and Hazzard, 1942). From the available data concerning the pounds per acre of wild trout removed by angling, it may be computed that from 80.5 to 94.8 per cent of the total poundage removed by angling was made up of trout of natural origin, even though generous plantings of legal-sized fish were made.

Indices to Angling Quality

Two indices for use in comparing angling quality are presented below, and in Table 1. One index, which has been used widely in the past, is the number of legal trout caught per hour of angling; the other index is the number of pounds of legal trout caught per hour of angling. After trials at computing several other indices to angling quality, such as percentage of successful anglers, size of trout etc. the simplest and most accurate measure appears to be the number of pounds of legal trout caught per hour per angler. This figure includes the factors of both number of fish and size of fish, both of which are generally considered equally important in determining the quality of angling.

Depending on which criterion is used to judge the creel census data, the listing of the streams will change position in determining which stream offered the better fishing. This is illustrated by the following listings:

	Judged on the basis of number per hour	Judged on the basis of pounds per hour
1939	Hunt Creek - (0.63)	Little Manistee --(0.107)
	White River - (0.60)	Pigeon River - (0.107)
	Pine River - (0.49)	White River - (0.103)
	Pigeon River - (0.48)	Pine River - (0.100)
	N. Br. Au Sable - (0.41)	N. Br. Au. Sable - (0.095)
	L. Manistee - (0.37)	Hunt Creek - (0.086)
	Canada Creek - (0.32)	Canada Creek - (0.078)
1940	East Branch of Tahquamenon - (1.02)	Fishdam River - (0.348)
	Fishdam River - (0.80)	East Branch of Tahquamenon - (0.238)
	Hunt Creek - (0.45)	N. Br. Au Sable - (0.086)
	N. Br. Au Sable - (0.33)	White River - (0.070)
	White River - (0.22)	Hunt Creek - (0.067)

It should be pointed out that the average sizes of the trout taken in the various streams contributed noticeably to the order of placement. In Table 2 will be found the average lengths and average weights of the various species of trout taken in the creel census areas in 1939 and 1940. Where there are no entries in the table, the species was not present, or were not captured by the anglers. If the ratings of the streams on the basis of pounds of trout captured per hour of angling are compared with the other available creel census data and the table of average sizes, it can be seen that in order to arrive at a high pounds-per-hour index, either a large number of trout must be taken per unit of effort, or the size of the trout caught must be above average. An extreme comparison to be found in the tabular material is between Hunt Creek and the Little Manistee River in 1939. On Hunt Creek the highest catch per hour (0.63 fish) was recorded, yet the fish were of the least average weight

(2.18 ounces), and the consequent calculation of the pounds-per-hour index was second from the bottom (0.086 pounds per hour). On the Little Manistee River the catch per hour was only 0.37 fish, yet the average size of all trout caught was over twice as large as on Hunt Creek and the calculation of the pounds-per-hour index was increased accordingly (0.107 pounds per hour) and more nearly to the true position as regards general angling quality.

It is the author's belief that the pounds of fish caught per unit of angling effort is the more valid index to use in comparing the quality of the angling between different bodies of water or comparing the results of the angling in different seasons or parts of the season on the same body of water, and this index will be used in the future whenever it is possible to obtain the weight of the anglers' catches.

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TABLE I

DATA FOR THE 1939 AND 1940 SEASONS ON PORTIONS OF MICHIGAN TROUT STREAMS COVERED BY INTENSIVE CREEL CENSUSES

Stream and (County)	Water area in acres	Total hours of angling	Angling hours per acre per season	Number of legal trout caught	Total pounds of legal trout removed	Number of legal trout caught per hour	Pounds of legal trout caught per hour	Pounds per acre of legal trout caught	Net yield ¹ per acre	Percentage of unsuccessful anglers
<u>1939</u>										
Pine River (Lake)	57.5	15,226.50	265	7,459	1,517.71	0.49	0.100	26.4	² 23.1	48
Pigeon River (Otsego)	65.4	6,754.75	105	3,213	725.38	0.48	0.107	11.1	³ ?	56
N. Br. Au Sable (Crawford)	54.5	7,050.00	129	2,914	673.06	0.41	0.095	12.3	² 11.6	63
Little Manistee (Lake)	17.7	2,333.25	132	862	249.51	0.37	0.107	14.1	² 11.4	59
Canada Creek (Presque Isle)	21.2	873.00	41	278	67.64	0.32	0.078	3.2	?	57
White River (Newaygo)	10.4	3,080.00	296	1,853	318.11	0.60	0.103	30.6	?	41
Hunt Creek (Montmorency)	4.3	780.50	175	492	66.98	0.63	0.086	15.6	?	55
<u>1940</u>										
N. Br. Au Sable (Crawford)	54.5	6,675.50	123	2,128	574.30	0.33	0.086	10.6	⁴ 9.6	63
White River (Newaygo)	17.5	2,131.75	122	448	148.50	0.22	0.070	8.5	⁴ 7.5	79
E. Br. Tahquamenon (Chippewa)	6.3	725.00	115	689	172.70	1.02	0.238	27.4	² 22.7	41
Fishdam River (Delta)	3.0	589.50	197	471	204.90	0.80	0.348	68.3	⁴ 64.7	42
Hunt Creek (Montmorency)	4.6	901.25	189	406	60.35	0.45	0.067	12.8	² 12.8	66

¹Total poundage minus weight of catch of legal-sized hatchery plantings.²All legal-sized hatchery plantings were marked.³Estimates impossible because all legal-sized hatchery plantings were not marked.⁴Based on percentage of legal-sized hatchery plantings taken in preceding years.

TABLE 2

AVERAGE LENGTHS AND AVERAGE WEIGHTS OF TROUT TAKEN BY ANGLING FROM PORTIONS OF MICHIGAN TROUT STREAMS COVERED BY INTENSIVE CREEL CENSUSES DURING THE 1939 AND 1940 TROUT SEASONS (LENGTHS ARE IN INCHES, WEIGHTS ARE IN OUNCES)

Stream and year	Brook Trout			Brown Trout			Rainbow Trout			All Trout	
	Number	Average length	Average weight	Number	Average length	Average weight	Number	Average length	Average weight	Number	Average weight
<u>1939</u>											
Pine River	1,448	7.9	2.97	12	8.9	5.33	6,001	8.5	3.32	7,459	3.26
Pigeon River	2,337	8.1	3.29	228	9.1	5.13	648	9.0	4.24	3,213	3.61
N. Br. Au Sable	2,430	7.8	2.83	464	10.5	8.04	20	9.5	7.80	2,914	3.69
Little Manistee	273	8.7	4.66	254	9.5	5.02	335	8.2	4.32	862	4.63
Canada Creek	265	8.4	3.86	2	7.2	2.15	11	7.3	5.02	278	3.89
White River	1,853	7.8	2.75	...	...	...	...	...	...	1,853	2.75
Hunt Creek	492	7.5	2.18	...	...	...	...	...	...	492	2.18
<u>1940</u>											
N. Br. Au Sable	1,759	8.9	3.16	355	11.1	10.00	14	9.1	6.17	2,128	4.32
White River	143	8.3	4.21	141	9.5	6.01	164	9.5	6.65	448	5.30
Fishdam River	446	9.1	6.76	25	11.0	10.56	471	6.96
E. Br. Tahquamenon	689	8.5	4.01	689	4.01
Hunt Creek	406	7.6	2.58	406	2.58

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