Original: Fish Division
cc: Education-Game
Inst. for Fish. Res.
C. T. Yoder
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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

ALBERT S. HAZZARD, PH.D.
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ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

February 9, 1954

Report No. 1398

PROGRESS REPORT ON THE EFFECT OF ANGLING RESTRICTIONS ON THE FISHING AND ON THE TROUT POPULATIONS OF THE NORTH BRANCH AND SOUTH BRANCH OF THE AU SABLE RIVER, CRAWFORD COUNTY ⁂

By

David S. Shetter

Abstract

North Branch

For 20 years prior to 1949, trout fishing regulations on this stream were the same as for the rest of Michigan--7-inch minimum size, creel limit 15 per day, any lure permitted. In 1949, following growth studies by E. L. Cooper, a 10-inch minimum size limit was inaugurated by Commission order from the Crawford-Otsego county line downstream to the Lovells Bridge. In 1950, at the insistence of local sportsmen, lures were limited to artificial fly. The creel limit was lowered to 10 fish of which only five could be brook trout, and the restricted area was extended 3 miles downstream to Eamon's landing. By Commission order, these restrictions will be in force through 1954.

Intensive creel census records taken by CCC enrollees during 1937-1939 in the same approximate stream area yield catch per hour indices ranging

⁂ This preliminary report was prepared for the benefit of Lansing and the field before all of the data were completely analyzed. A more complete report on the North Branch of the Au Sable is in preparation on this subject. (A. S. H.)

from 0.41 to 0.50 trout per hour. The average size of the brook trout caught was between 7 and 8 inches, while brown trout average sizes were between 9.5 and 10.5 inches.

To check the effect of the increased size limit and the lure restrictions, a partial creel census has been operated since 1950. Data have been taken each year at the same sites by the same department employee, following the same sampling schedule which allots equal time to the restricted water and to the normal portions of the North Branch. Because of the manner of collection, the records furnish a good sample of the trends in each type of water, although we can't obtain figures on total pressure or total catch from either.

Angling quality has been about the same in the 7-inch water as noted in 1937-1939 (0.44-0.52 fish per hour); in the 10-inch water quality has varied between 0.07 and 0.13 fish per hour. Despite the restrictions angler-use of the restricted water (404 to 574 trips yearly) has been heavier each year, except for 1950, than for the 7-inch water (430 to 487 trips yearly). The percentage of successful trips in the 10-inch water has increased regularly from 10.4 to 22.3. The observed brook trout catch has increased from 23 in 1950 to 104 in 1953, and brown trout catches have doubled (from 50 in 1950 to 108 in 1953). Catches of wild trout from the 7-inch water have varied as follows: brook trout, 331 (1950)to 469 (1952); brown trout, 97 (1950) to 184 (1951). With the increase which has occurred among catchable brook trout larger than 10 inches, it is estimated that the total poundage of wild trout taken from the 10-inch waters equals or slightly exceeds the poundage removed from the 7-inch waters.

Yearly collections with AC shocker provide additional evidence concerning changes in the trout population in the vicinity of the Twin Bridges,

and is augmented by a series of 5 collections made in each type of water in September, 1953. From these shocker samples it is concluded that the residual fall population of brook trout in the 10-inch water is about twice as large as that of the 7-inch water. For brown trout, the reverse is true. The protection afforded by increased size limit, lower bag limits, and lure restriction have increased the numbers of potential spawners among the brook trout, and reproduction appears to have doubled the numbers of young-of-the-year fish present when compared with data for pre-restriction years.

Scale samples, taken yearly from anglers' catches, show that 70 percent or more of the catch from the 10-inch water are third-summer brook trout, fourth-summer fish 30 percent or less. In the 7-inch water, the anglers' take consists of 2/3 to 4/5 two-summer-old brook trout (which have not yet spawned), most of the remainder are third-summer fish. Fall scale samples demonstrate that 70-90 percent of the spawning brook trout population in the restricted water is made up of fish completing their second summer of life, and are spawning for the first time. However, some third- and fourth-summer fish appeared in 1952 and 1953. This lack of older fish on the redds until recently suggests an intensive fishery on brook trout.

South Branch

From 1929 through 1951, the South Branch was fished under the usual state-wide trout regulations. In 1952 and 1953, a 10-inch minimum size limit, imposed by Commission order, was in effect from 300 feet below Steckert Bridge to the junction with the Main Stream; from 300 feet below Steckert Bridge to Smith Bridge only artificial flies are permitted as lures.

No creel census data are available for this stream prior to 1952, when a partial creel census, similar to that operated on the North Branch, was conducted. In 1953 volunteer creel census records from 4 different

sites were obtained from boxes equipped with blank forms, measuring boards, pencils and instructions. These records are not directly comparable with the 1952 records, and are incomplete.

In 1952, angling quality in the 10-inch, flies only, portion was at the level of 0.08 fish per hour, very similar to that observed on the restricted water of the North Branch. In the 10-inch, any lure, part of the South Branch the catch per hour was slightly higher (0.13 fish). From the 1953 records available it was concluded that, at least for those reporting, angling quality had not decreased from 1952 levels.

Shocker collections with DC electrofishing gear were made during the fall seasons of 1952 and 1953, spending from 6 to 9 hours of shocking at 20 or more sites. Over 800 trout were captured and measured each fall. We found that wild brown trout (size range 2.8-24.0 inches) outnumbered wild brook trout (size range 2.4-10.7 inches) over 2:1. In 1952, the shocker catch per hour of all trout was 136 fish (102 browns, 34 brooks). In 1953 a drop to 96 fish shocked per hour was noted (66 browns, 30 brooks). The decrease occurred mainly among brown trout less than 7 inches long, coincident with an increase in the proportion of fish larger than 7 inches among both brook and brown trout. The reason for the decrease is not yet apparent. Because no data are available for the period when a 7-inch size limit prevailed, it is impossible to state what changes have been brought about as a result of the restrictions imposed.

From the 1952 South Branch scale collections (the 1953 samples are still in the process of analysis) it was concluded that very few brook trout older than two summers are left after the angling season. The average size of the South Branch brook and brown trout age groups is similar to those of the North Branch, although it is tentatively concluded that South Branch trout grow somewhat slower after their first year of life.

Relatively few South Branch brown trout over five summers old were taken, although some specimens were found in each age group to and including 8 summers.

The 10-inch minimum size limit on the South Branch protects the second summer brook trout which have not yet spawned. However, it protects only a portion of the brown trout. In 1952 two-thirds of the two-summer-old brown trout were between 7.0 and 9.9 inches long, and only a fraction of these fish were mature.

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By

David S. Shetter

Summary of angling regulations on North Branch

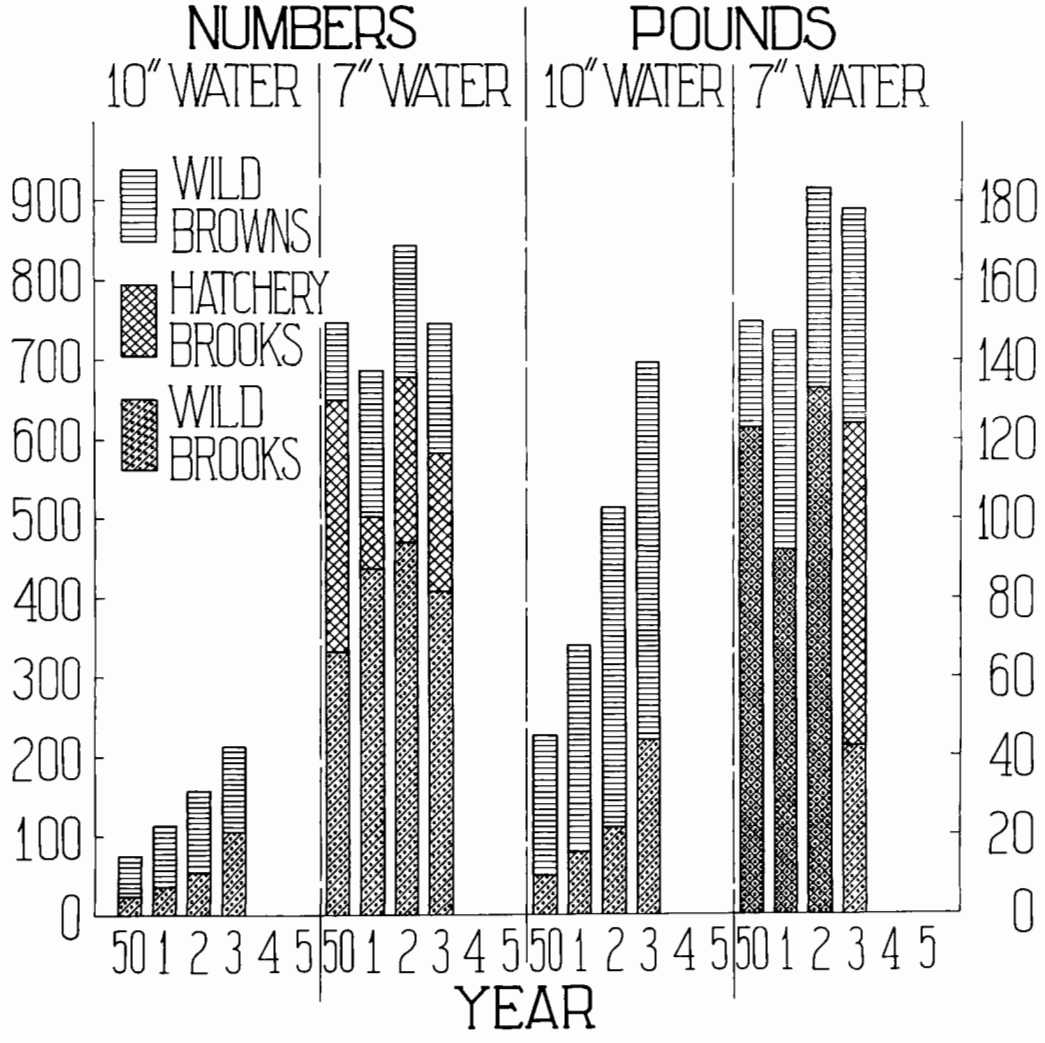
1929-1948 7-inch minimum size, daily creel limit 15 trout, both natural and artificial lures permitted, season ran from last Saturday in April to Labor Day (except for 1948 when the season first closed on the second Sunday in September).

1949 (Crawford - Otsego line to Lovells Bridge)
10-inch minimum size for brook trout only, daily creel limit of 15 trout, both natural and artificial lures permitted, season ran from last Saturday in April to the second Sunday in September.

1950-1953 (Crawford - Otsego line to Eamon's)
10-inch minimum size for all trout, daily creel limit of 10 trout of which not more than five could be brook trout, season ran from the last Saturday in April to the second Sunday in September.

*/ This prelininary report was prepared for the benefit of Lansing and the field before all of the data were completely analyzed. A more complete report on the North Branch of the Au Sable is in preparation on this subject. (A. S. H.)

OBSERVED CATCH OF BROOK AND BROWN TROUT NORTH BRANCH AU SABLE RIVER



Summary of angling results on North Branch

1929-1948 Intensive creel census data were collected by CCC enrollees in 1937, 1938, and 1939 on approximately the same stream section which was put under restriction in 1949. Under the regulations then in force, the simple catch per hour for those years varied as follows: 0.50, 0.48, 0.41. Total catches ranged between 2,436 and 3,143 trout, while total trips recorded varied between 1,622 and 2,134. Angler success in 1938 and 1939 was 48 and 37 percent, respectively. The average size of brook trout ranged between 7 and 8 inches, while brown trout seasonal averages varied between 9.5 and 10.5 inches (I.F.R. reports 526, 599).

1950-1953 Because of financial considerations, no census was conducted in 1949, and only a partial creel census was operated on the North Branch in 1950-1953, to check the effect of changes in angling regulations.

From 1950 to 1953 the partial creel census was taken yearly by the same Department employee, operating on the same achedule and covering the same sites. As many anglers as could be contacted were checked on four 10-hour days each week during the trout season. The sampling schedule included each Saturday, Sunday and holiday, plus one or two midweek days which were rotated at random. Alternate days were spent sampling restricted (10-inch) water and 7-inch water, so that an equal amount of sampling time was spent on each type of water. While these records do not furnish any data on total pressure or total catch, because of the manner in which they were collected, they do provide a good sample from which the angling trends may be followed.

ANGLER SUCCESS OBSERVED IN EQUAL CREEL CENSUS EFFORT ON 10″ AND 7″ WATER NORTH BRANCH AU SABLE RIVER

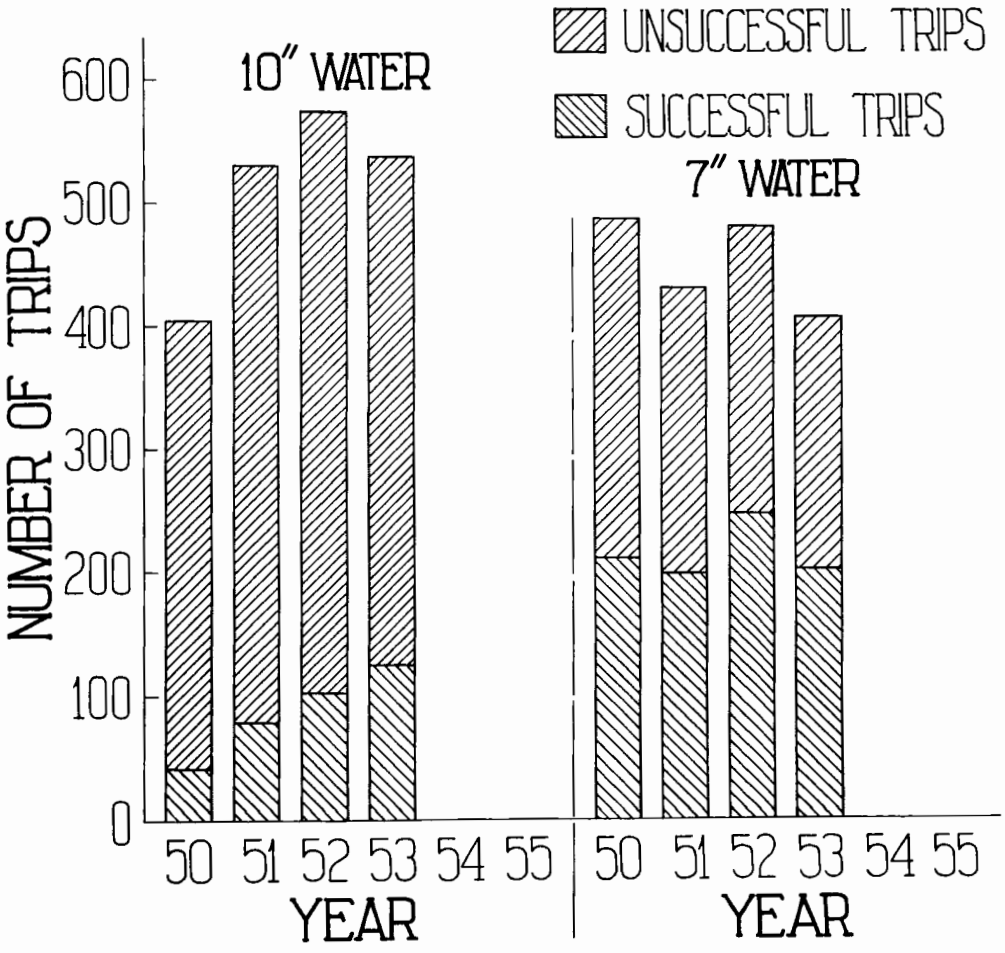


Table 1 gives the pertinent creel census summaries for the 10-inch and 7-inch waters for the 1950-1953 period. The following general conclusions may be drawn from the creel census data:

1. Except for 1950, more trips were checked on the 10-inch water than on the 7-inch water, indicating that the restrictions were looked upon with favor by the anglers, particularly during the last two seasons.

2. The percentage of unsuccessful trips decreased each year on the restricted water (from 89.6 in 1950 to 76.7 in 1953).

3. There has been a regular increase each year in the observed brook trout catch on the 10-inch water (from 23 in 1950 to 104 in 1953). The number of brown trout recorded in the restricted water increased also from 50 in 1950 to 108 in 1953.

The wild brook trout catch in the 7-inch water was 331 in 1951, and 469 in 1952. Brown trout catches were 97 in 1950 and 184 in 1951.

4. Angling quality, as measured either by the catch per hour, or catch per hour per angling trip has consistently been best in the 7-inch water as would be expected with the restrictions in effect. However, angling quality in the 10-inch water was significantly better in 1953 than for any previous year in the restricted water.

5. The average size of the anglers' catch from the restricted water, because of the size restriction, has been noticeably larger for the brown trout as well as the brook trout. By 1953 the total estimated poundage of wild trout taken by angling from the 10-inch waters slightly exceeds the estimated poundage of wild trout creeled by fishermen using the 7-inch water (Table 1a). Although the numerical catch might always be larger in the 7-inch water because of the lower size limit, a greater harvest poundagewise is possible in the 10-inch water because of the great difference in average weights of 7.0-9.9-inch trout and trout larger than

FALL CATCH OF BROOK TROUT
BY SHOCKER
TWIN BRIDGE AREA 10" WATER
NORTH BRANCH AU SABLE RIVER

YEAR	48	49	50	51	52	53	54	55
MINUTES OF SHOCKING	120	40	44	23	38	35		
TOTAL BROOK TROUT	230	157	160	---	---	245		
TROUT/HOUR UNDER 5"	68	83	89	---	---	221		
TROUT/HOUR OVER 5"	47	153	129	337	264	199		
TOTAL TROUT/HOUR	115	236	218	---	---	420		

10 inches. It is quite possible that the total poundage of fish taken by angling from the 10-inch water could, in the future, exceed the poundage removed from the 7-inch water, even though the numerical catch might always be larger in the 7-inch water because of the lower size limit.

Summary of shocker collections

Each year since 1948, timed collections of brook trout have been made by Institute personnel with an AC shocker in the vicinity of the Twin Bridge in the restricted water. The results of these collections, listed in Table 2, can be reduced to index figures of numbers of brook trout caught per hour of shocking, and the figures give evidence of the changes taking place in a limited section following the application of the restrictions. Also, in 1953, shocker samples were collected at five widely distributed points in the 7-inch water and from a similar number of sites in the 10-inch water. This series of collections, summarized for comparison in Table 3, provides evidence of the differences in the makeup of the trout populations of the two types of water. From these two series of data it is concluded:

1. The total fall residual brook trout population of the 10-inch water is now about twice as large as that of the 7-inch water (218 brook trout shocked per hour in the 10-inch water as against 91 brook trout shocked per hour in the 7-inch water). In some stream areas the brook trout may have increased as much as 3 to 4 times, following inception of the restrictions as indicated by the yearly index figures for the Twin Bridge area.

2. At present, based on the comparative samples of 1953, the total fall residual brown trout population of the 7-inch water is about twice as large as that in the 10-inch water.

FALL SHOCKER CATCH
OF BROOK AND BROWN TROUT
FIVE SAMPLE AREAS COMBINED
10" WATER VERSUS 7" WATER
NORTH BRANCH AU SABLE RIVER, 1953

	10" WATER		7" WATER	
	BROOK	BROWN	BROOK	BROWN
MINUTES OF SHOCKING	142		153	
TOTAL TROUT	517	113	231	241
TROUT/HOUR UNDER 5"	123	15	65	46
TROUT/HOUR OVER 5"	95	33	26	48
TOTAL TROUT/HOUR	218	48	91	94

3. The protection given fish smaller than 10 inches by the 10-inch limit, and the restriction of lure to artificial flies, have permitted an increase of brook trout larger than 5.0 inches to at least 3 times their former number.

4. As a result of the additional protection afforded by these restrictions, natural reproduction has doubled the number of young-of-the-year brook trout produced in the restricted water as compared to the 7-inch water, or the Twin Bridge area in pre-restriction years.

Summary of age studies on the North Branch

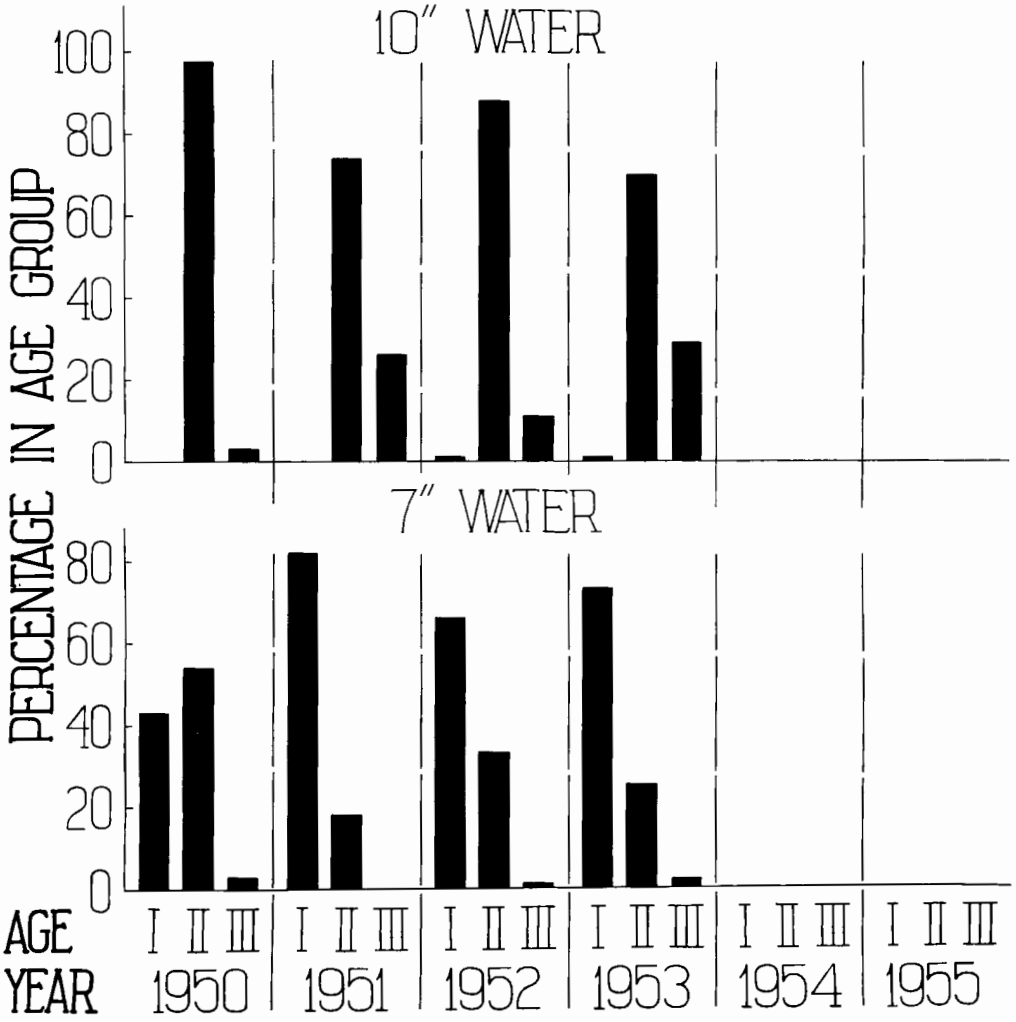
Scales from angler-caught brook trout have been collected each year on the two types of water. These have been studied by a micro projector, and ages determined. The age distribution of the anglers' catch in both waters is given in Table 4. Collections also were made each fall from brook trout taken with an electric shocker. These provide information on the age composition of the population remaining at the close of the trout season (Table 5). From these studies it may be concluded that:

1. In the 10-inch water the age composition of the anglers' catch is divided into about 70 percent or more third-summer fish (i.e., taken sometime during their third growing season) and 30 percent or less fourth-summer fish. Very few second-summer fish are 10 inches in length.

2. In the 7-inch water the age composition of anglers' catches differed in that from 2/3 to 4/5 of the catch usually consisted of second-summer brook trout, the remainder being third-summer fish, and a few fourth-summer fish.

3. A majority of the spawning population in the 10-inch water each fall has consisted of brook trout completing their second year of life. These age-group $\overset{I}{\wedge}$ fish (individuals which have passed two full summers in the

AGE COMPOSITION OF ANGLER-CAUGHT BROOK TROUT NORTH BRANCH AU SABLE RIVER



stream and which show only one year-mark on their scales) are spawning for the first time. Relatively few age-group II fish were found until 1952 fall shocking, and almost no age-group III brook trout were taken in any of the fall collections. This lack of older, larger fish probably reflects the intensity of the angling on the species.

4. The size range observed for age I brook trout suggests that 10 inches is a good minimum size limit. The brown trout should eventually benefit to some degree from the same size limit also, inasmuch as relatively few brown trout are observed to be mature before they reach a size of at least 10 inches.

(Note. Scale samples for 1953 are available from the shocker collections for the 7- and 10-inch water, but time has not permitted completion of mounting and age analysis. Nor has the time available permitted back-calculations on growth from the various samples taken to determine growth changes, if any, between different years).

The creel census data indicate that the number of brook trout larger than 10 inches has increased yearly since 1950 under the 10-inch minimum size and the restriction to artificial flies. Collections with the shocker provide evidence that the total population of the restricted water has increased. The scale sample collections suggest that there has been little, if any, change in the size ranges of the various age groups in the 10-inch water from 1950 through 1953.

Analysis of the scale collections taken from the angler on the 7-inch water plus limited collections with the shocker suggest that if the restrictions were extended to the entire North Branch below Dam 2, similar fishing could be expected over the entire stream within a period of 5

years. It should be further pointed out that this extremely sporting angling could be provided without the addition of any artificially-reared fish to the stream system.

South Branch Au Sable

Summary of regulations

1929-1951 15 trout per day (reduced by state-wide legislative act in 1951 to 10 per day), 7-inch minimum size, either natural or artificial lures of any kind permitted. Season ran from last Saturday in April to Labor Day (until 1948, since when it closed on the second Sunday in September).

1952-1953 10 inches minimum size from Smith Bridge to junction with the Main Stream of the Au Sable, any lure permitted; between a point 300 feet below Steckert's Bridge to Smith Bridge, 10-inch minimum size and artificial flies only permitted as lures.

Summary of angling results

No intensive creel census data are available prior to 1952.

In 1952 a partial creel census was operated on a plan similar to that employed on the North Branch of the Au Sable. Equal amounts of sampling time were scheduled for the 10-inch "fly" water and on the 10-inch "any-lure" water.

In 1953, financial considerations did not permit employment of a creel census clerk. Some information was accumulated through the use of volunteer records obtained by placement of blank forms, pencils, measuring boards and sample forms in creel census boxes at four different fishing sites along the river. The 1953 records forthcoming from this type of census are not directly comparable with those collected in the previous year, and are incomplete particularly as to the amount of time fished. The available creel census information is summarized in Table 6. From these it is concluded:

1. Catch per hour in the 10-inch, flies only, portion of the South Branch in 1952 was 0.08 fish, very similar to that observed on the restricted water of the North Branch. In the 10-inch, any lure, portion the catch per hour was slightly higher (0.13 fish per hour).

2. The 1953 records suggest that, at least for those reporting, angling quality had not decreased over the previous year.

Summary of shocker studies

In 1952, shocker collections were made with the DC shocker at 21 stations. These were again repeated in October of 1953 at 20 of the same sites. The data on these collections are presented in Table 7 and suggest the following conclusions:

1. Wild brown trout outnumber wild brook trout in the South Branch in the ratio at least 2:1. The size range of the fall brook trout population is from 2.4 to 10.7 inches, of the fall brown trout population, 2.8 to 24.0 inches. These upper limits were also about the same for angler-caught fish in both 1952 and 1953.

2. In 1952 the total number of trout shocked per hour was 136 (102 brown trout, 34 brook trout). In 1953 there was a drop in the catch per hour with the shocker to 96 fish per hour (66 brown trout, 30 brook trout). Most of this drop occurred in the brown trout population among the fish less than 7 inches long. It can be shown that the proportion of fish larger than 7 inches increased both among the brook trout and brown trout. The reason for the apparent decrease among the brown trout less than 7 inches long is not now clear.

3. Because no data are available for the period when 7-inch size limit prevailed, it is impossible to state what changes have taken place as a result of the restrictions imposed.

Summary of age data, South Branch

A good series of scale samples were taken both in 1952 and 1953 for age determination. Ages have been determined for the 1952 samples, but time has not permitted analysis of the 1953 collections. The data for 1952 are given in Table 8. From this it may be concluded:

1. As on the North Branch, very few brook trout older than three summers are left after the angling season.

2. The average size of the age groups of the South Branch brook trout is approximately the same as for North Branch brook trout, but South Branch age group I brook trout appear to be somewhat smaller than age group I brook trout from the North Branch.

3. South Branch brown trout, compared with figures reported by Tody (1949, I.F.R. report #1223) for the North Branch grow at a slightly slower rate after their first summer. As on the North Branch, relatively few brown trout older than five summers were found. The brook trout population of the South Branch appears to continue at a relatively low level despite two years of varied restriction. It needs all the protection it can be given if the species is to increase in numbers. Since some of the best brook trout concentrations have been noted below Smith Bridge, the extension of the "flies only" restriction from Smith Bridge downstream might be considered as an aid to the brook trout. The 10-inch minimum size limit protects the age group I fish which have not yet spawned for the first time.

Brown trout also are protected by the 10-inch minimum size limit so that a somewhat increased number should be left to spawn. However, even a 10-inch size limit does not protect a majority of female brown trout to first spawning. In the 1952 scale samples, 2/3 of the age group I fish were between 7.0 and 9.9 inches. Many of these fish will not spawn for the first time until the third fall of life (age group II).

If it is desired to encourage sporting methods of taking trout, and at the same time get the most sport possible from the available population, the lures used should be restricted to artificial flies. The recent investigations of Allison and Shetter (1953), I.F.R. report #1366 strongly suggest that flies cause much less mortality to undersize fish which are hooked than do worms, which are probably the most widely used trout lure.

INSTITUTE FOR FISHERIES RESEARCH

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Typed by: P. R. Darling

Table 1.--Summary of partial creel census statistics, North Branch Au Sable River, Crawford County, 1950-1953 inclusive
(Average total lengths are in parentheses, and are given in inches)

Type of water	Year	Number of angler-trips contacted	Total unsuccessful trips	Hours of fishing	Brook trout		Brown trout	Rainbow trout	Total catch observed	Catch per hour all trout
					Wild	Hatchery				
10-inch	1950	404	362	1,055.5	23 (10.2)	...	50 (12.5)	...	73	0.07
	1951	530	451	1,605.5	36 (10.3)	...	76 (11.9)	...	112	0.07
	1952	574	471	1,747.5	52 (10.4)	...	105 (12.5)	...	157	0.09
	1953	537	412	1,658.5	104 (10.3)	...	108 (13.0)	...	212	0.13
7-inch	1950	487	276	1,683.5	331	318 (7.7) [1]	97 (9.0)	...	746	0.44
	1951	430	232	1,541.0	436	65 (7.5) [1]	184 (8.4)	...	685	0.44
	1952	480	233	1,743.0	469	208 (7.7) [1]	166 (8.7)	7 (9.4)	850	0.49
	1953	407	205	1,443.0	407 (7.7)	175 (8.3)	163 (9.1)	...	745	0.52

[1] In these years the average size listed under "hatchery brook trout" is for wild and hatchery fish combined. The two types were not separated in the listing of measurements until the 1953 season.

Table 1a.--Estimated [a] weight of observed trout catches, 1950-1953 inclusive, 10-inch and 7-inch waters, North Branch of Au Sable River

Year	10-inch water			7-inch water		
	Brook trout	Brown trout	Total	Brook trout	Brown trout	Total
1950	8.85	35.54	44.39	123.14 [b]	27.36	150.50
1951	14.76	53.06	67.82	92.92 [b]	49.69	142.61
1952	22.10	80.08	102.18	133.06 [b]	51.56	184.62
1953	44.27	94.78	139.05	123.23 [b]	54.03	177.26
				(80.69) [c]		(134.72) [c]

[a] Brook trout weights estimated from length-weight curve for Michigan brook trout prepared by E. L. Cooper (1949). Brown trout weights estimated from length-weight curve prepared for North Branch brown trout by W. L. Tody (1949 I.F.R. Report No. 1223), E. L. Cooper (1949) is doctoral thesis, I.F.R. Report No. 1249.

[b] Weights are for hatchery and wild fish combined.

[c] Weight of wild trout.

Table 2.--Size composition of brook trout captured by AC shocker, Twin Bridge to Akron Club, North Branch of the Au Sable, 10-inch water, with catch per hour indices (Percent of total sample in each size group is given in parentheses)

Size range in inches	Year					
	September 1948	November 1949	October 1950	October 1951	September 1952	September 1953
2.0 - 2.9	44 (19)	5 (3)	1 (1)	...*	...*	15 (6)
3.0 - 3.9	83 (36)	28 (19)	20 (13)	...*	...*	88 (36)
4.0 - 4.9	8 (3)	21 (13)	44 (27)	...*	...*	26 (11)
5.0 - 5.9	9 (4)	5 (3)	26 (16)	1	10	22 (8)
6.0 - 6.9	26 (11)	14 (9)	10 (6)	12	15	24 (10)
7.0 - 7.9	52 (23)	36 (23)	21 (13)	29	69	21 (9)
8.0 - 8.9	6 (3)	35 (22)	23 (14)	60	46	29 (12)
9.0 - 9.9	2 (1)	11 (7)	8 (5)	21	18	15 (6)
10.0 - 10.9	...	2 (1)	6 (4)	5	8	2 (1)
11.0 - 11.9	...	...	1 (1)	...	1	3 (1)
12.0 - 12.9	...	...	...	...	...	...
13.0 - 13.9	...	...	...	1	...	...
Total collected	230	157	160	129	167	245
Minutes shocked	120	40	44	23	38	35
Fish shocked per hour						
0" - 4.9"	68	84	89	...	...	221
Over 5.0"	47	155	130	337	264	199
All fish	115	236	218	...	...	420

* Fish in these inch-groups were not recorded in these years.

Table 3.--Comparison of brook and brown trout populations, 10-inch and 7-inch waters, North Branch of the Au Sable, September, 1953

Size range in inches	Totals, 10-inch water		Totals, 7-inch water	
	brook	brown	brook	brown
2.0 - 2.9	41	...	38	4
3.0 - 3.9	200	22	97	75
4.0 - 4.9	50	14	30	39
5.0 - 5.9	47	...	15	2
6.0 - 6.9	52	...	27	8
7.0 - 7.9	43	11	20	29
8.0 - 8.9	43	16	2	37
9.0 - 9.9	31	11	1	11
10.0 - 10.9	7	4	1	2
11.0 - 11.9	3	5	...	7
12.0 - 12.9	...	9	...	5
13.0 - 13.9	...	5	...	11
14.0 - 14.9	...	5	...	5
15.0 - 15.9	...	9	...	3
16.0 - 16.9	...	2	...	3
Totals	517	113	231	241
Minutes shocked	142		153	
Shocked per hour				
0 - 4.9"	123	15	65	46
5.0" +	95	32	26	48
All fish	218	47	91	94

Table 4.--Age composition of angler-caught brook trout, 10-inch and 7-inch water, North Branch of the Au Sable, 1950-1953 (Size range in inches given in parentheses)

Type of water	Year	Age group	Month of season						Totals	Percent of sample in age group
			April	May	June	July	August	September		
10-inch	1950	II	...	6	17	10	3	...	36 (9.6 - 10.5)	97
		III	...	...	1	...	...	...	1 (11.5)	3
	1951	II	1	14	14	5	1	...	35 (9.7 - 11.0)	74
		III	3	4	3	1	1	...	12 (10.0 - 11.5)	26
	1952	I	...	...	1	...	...	...	1 (10.0)	1
		II	5	28	15	10	4	3	65 (9.7 - 11.6)	88
		III	...	3	5	...	...	...	8 (10.3 - 14.0)	11
	1953	I	...	...	...	1	...	...	1 (10.3)	1
		II	10	35	42	8	4	3	102 (9.0 - 11.5)	70
		III	9	16	13	2	1	1	42 (8.8 - 12.2)	29
7-inch	1950	I	...	...	12	10	3	8	33 (7.0 - 8.7)	43
		II	...	28	8	3	2	1	42 (7.0 - 9.6)	54
		III	...	2	...	...	...	...	2 (9.3 - 9.6)	3
	1951	I	...	14	58	79	83	35	269 (6.7 - 8.9)	82
		II	6	44	6	3	1	...	60 (7.0 - 10.1)	18
	1952	I	...	5	13	44	166	...	228 (6.7 - 8.8)	66
		II	21	40	10	4	5	33	113 (6.9 - 10.2)	33
		III	2	1	1	1	...	...	5 (7.6 - 11.4)	1
	1953	I	...	15	44	46	42	18	165 (6.8 - 8.8)	73
		II	7	13	24	8	3	2	57 (7.4 - 11.9)	25
		III	4	1	...	...	...	...	5 (8.6 - 11.4)	2

Table 5.--Age composition of fall samples, 10-inch water, North Branch of the Au Sable, collected by electric shocker

Year	Item	Age group				Mature fish
		0	I	II	III	(I + II + III)
1948	Number	137	91	2	...	93
	Av. size	3.37	7.18	8.78		7.1
	Size range	2.2-5.8	5.2-9.3	7.6-9.7		5.2-9.7
1949	Number	5	59	12	...	71
	Av. size	4.82	8.03	9.13		8.2
	Size range	4.6-5.2	5.6-9.9	7.3-10.1		5.6-10.1
1950	Number	5	34	3	...	37
	Av. size	5.30	7.59	10.33		7.8
	Size range	5.0-5.7	5.6-9.0	10.2-10.5		5.6-10.5
1951	Number	10	36	4	...	40
	Av. size	5.23	8.36	9.58		8.5
	Size range	4.3-6.0	6.8-9.5	8.2-10.6		6.8-10.6
1952	Number	4	187	73	1	261
	Av. size	4.28	7.18	8.99	9.1	7.7
	Size range	4.1-4.5	5.0-9.7	7.5-10.7	9.1	5.0-10.7

Table 6.--Creel census records, 1952 and 1953, South Branch of the Au Sable River, Crawford County

Year	Type of water	Total angling trips	Total trout caught			Total catch	Percentage wild trout in catch
			brook	brown	rainbow		
1952	10-inch flies only	287	23 (10.0)	86 (11.3)	5 (10.2)	114	96
	10-inch any lure	157	14 (8.2)	97 (11.2)	5 (10.9)	96	98
1953 [1]	10-inch flies only	217	53 (10.6)	245 (12.5)	11 (12.1)	309	87
	10-inch any lure	11	3 (10.0)	22 (12.4)	...	37	100

[1] Records for 1953 by volunteers, and not comparable with the 1952 records collected by partial creel census. Many of the 1953 records failed to list hours fished, thus it is not possible to calculate any catch per hour indices.

Table 7.--Summary of DC shocker collections, South Branch of the Au Sable River

Year	Minutes of shocking	Brook trout		Brown trout		Ratio of 7.0 - 9.9" trout to 10" + trout	Total collected	Trout shocked per hr.
		Number (per hr.)	Size range in inches	Number (per hr.)	Size range in inches			
1952	362	208 (34)	2.6 - 10.1	607 ^{16} (102)	2.8 - 23.7	95 ^{12} : 157 ^{4}	821 *	136
1953	530	264 (30)	2.4 - 10.7	580 ^{8} (66)	3.0 - 24.0	227 ^{6} : 201 ^{2}	847 **	96

^{n} Numbers in superscript indicate numbers of marked hatchery fish captured and included in total.

* Includes 6 rainbows - 5 wild and 1 hatchery fish.

** Includes 3 rainbows - 1 wild and 2 hatchery fish.

Table 8.--Age of brook and brown trout fall collection, 1952, South Branch of the Au Sable

Age group	Brook trout Total length in inches Number	Average	Range	Brown trout Total length in inches Number	Average	Range
0	103	3.9	2.6 - 5.3	92	4.1	2.8 - 5.5
I	31	6.4	4.0 - 9.4	95	6.3	4.3 - 9.8
II	3	9.3	8.4 - 10.1	111	10.9	7.7 - 14.2
III	...	...	...	32	14.6	11.0 - 20.2
IV	...	...	...	8	17.2	15.4 - 18.8
V	...	...	...	4	19.6	17.7 - 21.5
VI	...	...	...	1	20.1	20.1
VII	...	...	...	1	21.7	21.7