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FISHING AND BOATING ON SEGMENTS OF THE
AU SABLE RIVER IN MICHIGAN, 1960-63¹

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Abstract

Fishing and boating activity on 50.2 miles of the Au Sable River in Crawford and Otsego counties, Michigan, was measured by stratified random sampling during 1960-63. On the main stream of the Au Sable and South Branch of the Au Sable man-hours of canoeing far exceeded fishing activity, whereas fishing constituted all but a minor fraction of the recreational activity on the North Branch of the Au Sable.

Observations during the daily period 8 AM-11 PM between the last Saturday in April and the second Sunday in September (regular trout season) led to the following estimates of average total hours of recreation (canoeing plus fishing) per season:

Main Au Sable River	--	11,325 hours per mile per season
South Branch	--	3,354 hours per mile per season
North Branch	--	1,729 hours per mile per season

On the Main Au Sable 32% of the recreational use was angling; on the South Branch, 44%; on the North Branch, 99.7%.

On all three streams most of the fishing was done between Decoration Day and July 4. On the Main Au Sable the most boating was done during the third and fourth quarters of the trout season, but the first quarter was preferred by the South Branch canoeists.

Simultaneous use by anglers and canoeists on the Main Stream and South Branch is an important source of conflict. On the North Branch, where little boating is done, angler activity is fairly uniform during the day. On the Main Au Sable and South Branch angler use increased sharply after 6 PM, when boater use was light.

Anglers and boaters mainly came from the metropolitan areas of southeastern Michigan; 10% were from other states. Thirty-nine per cent of the boaters were under age 17, but only 3 to 7 per cent of the anglers were under 17.

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¹ Contribution from Dingell-Johnson Project F-27-R, Michigan.

Introduction

This paper summarizes certain recreational statistics gathered during the course of fisheries investigations on the Au Sable River in Michigan. Portions of the main stream of the Au Sable² and two tributaries, the South Branch and North Branch (all in Crawford and Otsego counties) were censused during the 1960-63 trout fishing seasons. This river system, located in the north-central part of Michigan's lower peninsula, has supported a noteworthy trout fishery for almost three-quarters of a century.

Over the past 20 years recreational boating has increased tremendously in contrast to fishing. The type of boat used most frequently is the canoe. However, on the Main Au Sable and South Branch a long, narrow, flat-bottomed craft (the "Au Sable River boat") is used frequently, and occasionally conventional rowboats are used. The conflict for space between anglers and pleasure boaters is very keen, particularly on week ends, and is considered intolerable by some anglers and property owners.

In this paper we present data on intensity of fishing and boating on these waters by parts of the season, days of the week, and hours of the day. These statistics are of much current interest and also will be of value in appraising future changes in recreational use of the river.

² Hereafter referred to as "Main Au Sable."

Study areas

The portions of the Au Sable River system and their study sections which are involved in this review are described in Table 1 and shown in Figure 1. Along these streams there is extensive cottage development on approximately 90% of the Main Au Sable, 50% of the South Branch, and 40% of the North Branch. Year-around residences, cabins, and a hotel are restricted mostly to the Main Au Sable at Grayling, and to the Lovells area on the North Branch.

Public access for boaters and fishermen exists for all waters but varies considerably. Four miles is the greatest distance between access points. State lands, fishing sites, county roads, and commercial canoe liveries provide most of the public access sites. Boating and fishing also originate from private lands along each stream.

Physically, these rivers are suitable for both boating and fishing. River gradient averages about 5.5 feet per mile in the Main Au Sable, 4.4 in the South Branch, and 8.7 in the North Branch. Most of these waters can be fished readily by a wading angler. During periods of low water some riffle areas, particularly in the upper North Branch, are shallow enough to strand canoes; at such times boaters must drag or push canoes for short distances across the riffles. Average width is 92 feet on the Main Au Sable, 69 feet on the South Branch, and 96 feet on the North Branch.

The surface soil on the Au Sable drainage consists mainly of glacial deposits. Thus the river beds are mostly sand or gravel, but

Table 1. --Au Sable River study sections, locations, stream mileages, and dwelling developments

River and section	Location	Miles of stream ¹	Residences	Cabins
Main Au Sable				
Upper	Grayling (Maple St.) to Burton's landing	5.6	16	24
Lower	Burton's to Wakeley Bridge	8.7	30	93
South Branch				
Upper	Deerheart Valley Rd. to Downey's	7.1	3	14
Lower	Downey's to mouth	9.0	2	28
North Branch				
Upper	Dam 2 to County line (Otsego Co.)	4.2	..	3
Middle	County line to Eaman's	6.9	15	45 ²
Lower	Eaman's to Kellogg Bridge	8.7	1	26

¹ Measured from aerial photos.

² Includes one hotel in Lovells.

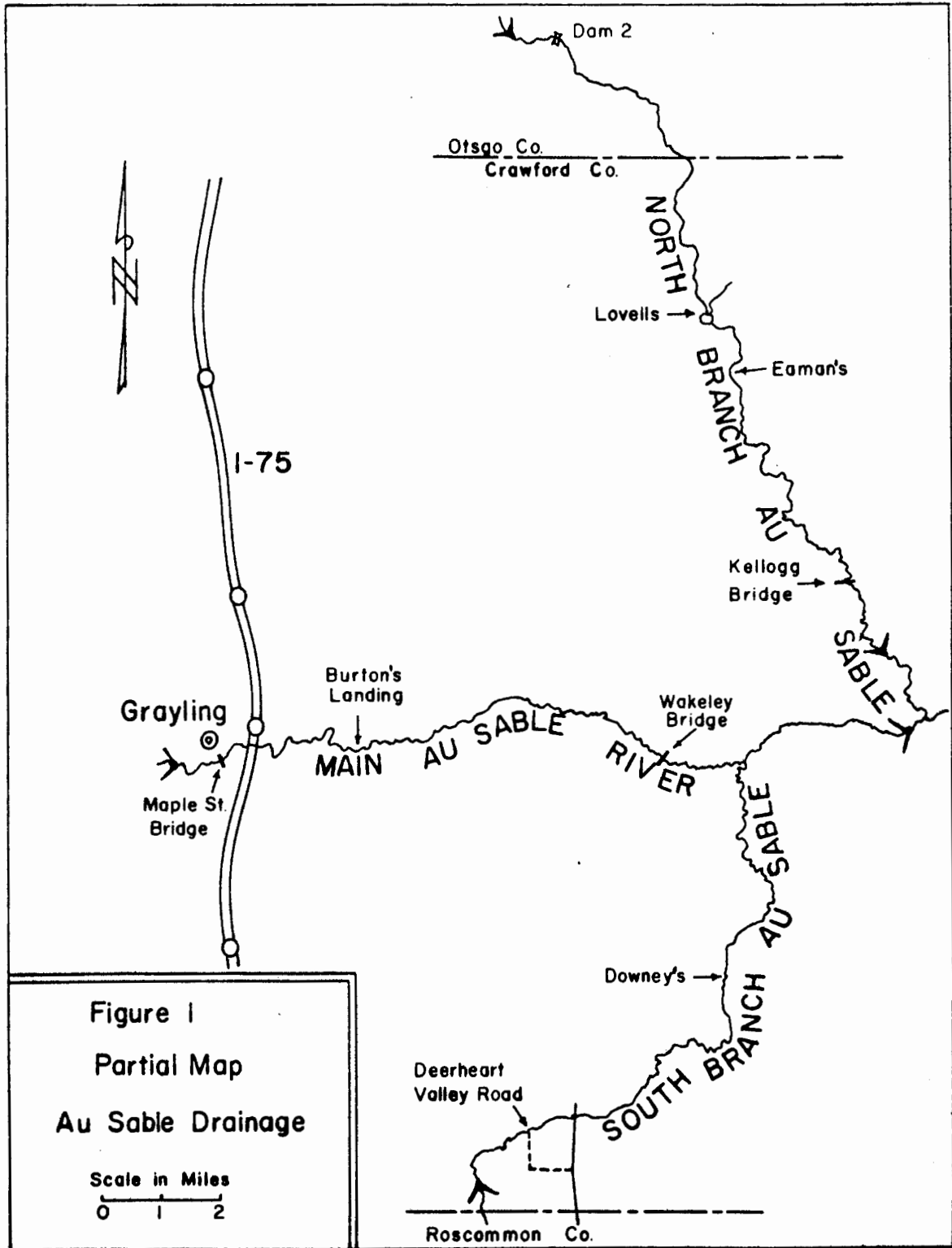


Figure 1

there is some silt, clay and cobble. Forest types along the rivers vary from lowland hardwoods, aspen, jack-pine, and tag alder to coniferous swamp.

Census methods

The objective was to calculate the man-hours of use for the various recreational activities. Boating and fishing usage were estimated by stratified random sampling during the 1960-63 trout fishing seasons for daily activity between 8 AM and 11 PM. The trout season extended from the last Saturday in April to the second Sunday in September during this study. There was also considerable canoeing before and after the trout season, but this was not censused. The trout season was divided into four quarters, each about 5 weeks long. Intensity of recreational use was heaviest on week ends and holidays; therefore, half of the sampling was done at those times. Each day was divided into three 5-hour periods when boaters and fishermen were counted and contacted (8 AM-1 PM, 1 PM-6 PM, and 6 PM-11 PM). Sampling effort was divided equally among these daily time strata. Finally, calculations were made for each stratum, and then summed for totals.

Certain terms should be defined here to clarify the fishing and boating statistics measured by the instantaneous-count, sampling procedure. The categories used were: wading and bank fishing, active fishing from a boat, loitering by boat fishermen, and pleasure boating. Wading anglers were persons who fished the river by wading the river

bed. Bank anglers were persons actively fishing while walking along the bank or still fishing from the bank with a line in the water. A boat angler was a person actively casting with line in the water at the instant of the count, but persons not actively fishing at the counting instant were classified as not fishing.

Using the above definitions and methods, we calculated the active man-hours of fishing from boats. Depending on one's definition of fishing, you might argue that if a person fished at any time during the boat trip, or just guided for an active fisherman, they should be classified as fishing all the time. For those who take this point of view we have included, in Table 2, separate estimates and tabulations of (1) active fishing from boats, (2) loitering or guiding by boat fishermen, and (3) recreational boating (boating with no fishing involved during the trip). These divisions were based on data collected from random interviews of boaters upon completion of their trips. Total fishing is the sum of wading, bank, and active fishing from boats. Total boating is the sum of active fishing from boats, loitering or guiding by boat fishermen, and pure recreational boating. Total recreation is the sum of total boating plus the wading and bank fishing.

Two census clerks worked as a team 40 hours per week on the Main Au Sable and South Branch. One clerk traveled downstream through designated river sections by canoe and counted recreationists. These counts were the basis for estimating man-hours of fishing and boating. The other census clerk interviewed anglers and boaters to get individual trip statistics on their fishing, boating, residence, trip origin, age, and other details.

Table 2. --Fishing and boating activity on the Au Sable River during the trout seasons of 1960-63, expressed as average man-hours per mile per season. (See text for definitions of the various activities.)

River and section	Fishing			Boating			Total recreation
	Wade and bank	Boat	Totals	Pleasure	Loitering	Totals ¹	
Main Au Sable							
Upper	1,143 (142) ²	911 (246)	2,054 (439)	8,942 (1,927)	676 (183)	10,529 (2,134)	11,672 (2,121)
Lower	3,311 (199)	1,275 (155)	4,586 (232)	5,802 (289)	714 (82)	7,791 (270)	11,102 (284)
South Branch							
Upper	1,411 (148)	192 (78)	1,603 (194)	2,195 (1,046)	138 (56)	2,466 (1,170)	3,877 (1,256)
Lower	1,212 (313)	137 (58)	1,350 (64)	1,493 (203)	99 (40)	1,729 (132)	2,941 (213)
North Branch							
Upper	590 (94)	2	593 (95)	1	1	4	594 (90)
Middle	3,060 (405)	6	3,071 (409)	4	5	15	3,075 (411)
Lower	1,183 (68)	10	1,202 (65)	7	9	26	1,209 (64)

¹ Includes boat fishing.

² Standard errors in parentheses.

A census plan was made prior to the fishing season for each river section, i. e., upper Main Au Sable, lower Main Au Sable, etc. Fifteen sub-sections of river in each section, each one-tenth of a mile long, were selected and marked by easily viewed terminal markers. These 15 sub-sections were selected so that the clerk could see each end and count all boats and occupants from the mid-point of the sub-section. These sub-sections were spaced quite evenly throughout the length of the section. For example, the upper Main Au Sable (Table 1) is 5.6 miles long and the 15 sub-sections, which add up to 1.5 miles, represented over one-fourth of the section. As the clerk counted boats and occupants in these sub-sections he could easily determine which persons were fishing and which were simply boating.

The census clerk who counted anglers and boaters on the Main Au Sable and South Branch employed two procedures. A large number of anglers fished from shore or by wading, and the clerk simply counted these anglers as he canoed past them on his trip through the river sections. This gave an instantaneous count for a particular time period. From a good knowledge of angler habits, we are sure that there was little bias in these counts, such as might have resulted if wading anglers consistently moved either considerably upstream or downstream.

The second counting procedure used by the clerk was applied to occupants of canoes and other boats. These boaters usually traveled downstream at an appreciable rate, and the clerk could not get a complete count for a given section of river. Therefore he made instantaneous counts of occupants in boats within the 15 sub-sections of river, and

these sample counts were totaled for the stream section (e.g., the lower Main Au Sable).

In the North Branch the clerk traveled downstream in a canoe and counted all shore and wading anglers. Boats and boat anglers were scarce and no sub-section counts, such as on the Main Au Sable, were attempted. Rather, boating hours were estimated from the personal contacts which the census clerk had with individual anglers and pleasure boaters. The clerks obtained records of fishing and boating activity from a sample of persons leaving the river.

For all waters, the catch per hour of trout was determined from interviews of anglers leaving the river. These rates were calculated by dividing the trout catch by the active hours of fishing effort either by bank, wading or boat fishing. Also, the species and size composition of the catch was determined from these catches.

Recreational use of the streams

The annual estimates of boating and fishing on the three branches of the Au Sable presented in Table 2 are given in man-hours per mile of river to facilitate comparisons between river sections.

Angling pressure

Annual fishing pressure varied between extremes of 4,586 hours per mile in the lower section of the Main Au Sable to 593 hours per mile in the upper section of the North Branch. Fishing activity along the Main Au Sable was more than twice as intensive in the lower as in the

upper section (2,054). The greater pressure in the lower Au Sable than in the upper Au Sable is the result of better public access and a more dense trout population.

Annual fishing pressure on the South Branch of the Au Sable (1,350-1,603 hours per mile) is only half that of the Main Au Sable. Within the South Branch, fishing intensity is somewhat higher in the upper section (1,603); again, public access is better in that part of the South Branch.

Angling pressure on the North Branch varies greatly between the three study sections. The middle section receives twice as much fishing as the lower section and five times as much as the upper section. Accessibility is one of the most important factors in determining this use. Another important factor was the type of fishing regulations in effect on the different sections of the river. In general, angling activity was reduced by one-half where there were special restrictions on lures, lower daily creel limits, and higher minimum legal lengths, as compared with angling under normal Michigan trout fishing rules (Shetter and Alexander, 1962; Shetter and Alexander, 1966). The lower section was fished under special regulations during the 1960-63 period; the middle section was fished under special regulations in 1960, but under normal rules during 1961-63; and the upper section was fished under normal rules in 1960, but under special regulations during 1961-63.

Non-boat angling

In the upper Main Au Sable, 56% of the fishing was done by wading or from the bank. A much greater proportion, 72%, was expended by waders and bank anglers in the lower Main Au Sable. In the South Branch, about 89% of the fishing was done from the bank or wading the stream. North Branch anglers fished 99% of the time by wading or shore fishing.

Boat trips by fishermen

Persons who fished once in a while during boat trips sometime spent part of the time loitering or guiding the boat for fellow fishermen. The latter time was not considered fishing time (Table 2). On the upper Main Au Sable 57% of the total hours expended by boat fishermen was spent actively fishing, whereas 64% was active fishing in the lower section. In the South Branch 58% of the boating hours was spent actively fishing.

One reason for separating the boating hours into the two categories of active fishing and loitering or guiding was that catch per hour of trout was calculated from fish caught per active hour of fishing. We believe this is more comparable with rates of catch calculated for wading or shore fishing.

Total boating during trout season

Man-hours of boating was heaviest on the upper Main Au Sable (10,529 hours per mile) whereas there was almost none on the upper

section of the North Branch (4 hours per mile). Of the boating activity on the Main Au Sable, 85% in the upper section and 74% in the lower section consisted solely of pleasure boating. In the upper and lower sections of the South Branch, pleasure boating comprised about 88% of the total man-hours of boating. Probably the upper sections of both the Main Au Sable and the South Branch receive more boating activity than do their lower sections because of the upstream location of commercial canoe liveries.

Total recreational activity

Total man-hours of recreational activity (boating plus fishing) was greatest in the upper section of the Main Au Sable (11,672 hours per mile), but the lower section of the same stream was used almost as intensively (11,102 hours per mile). Usage of the South Branch and the middle section of the North Branch varied between 2,941 to 3,877 hours per mile. Average man-hours of recreation expended was: 1,209 hours in the lower section and only 594 hours in the upper section of the North Branch (Table 2).

Fishing vs. boating

The fishing season was divided into quarters to show the seasonal distribution of fishing and boating. On all three rivers, fishing pressure was greatest during the second quarter (Figure 2). The first quarter receives the next highest usage, followed by the third and fourth quarters. The seasonal distribution of fishing was similar for all three rivers, in spite of the fact that the boating activity varied widely.

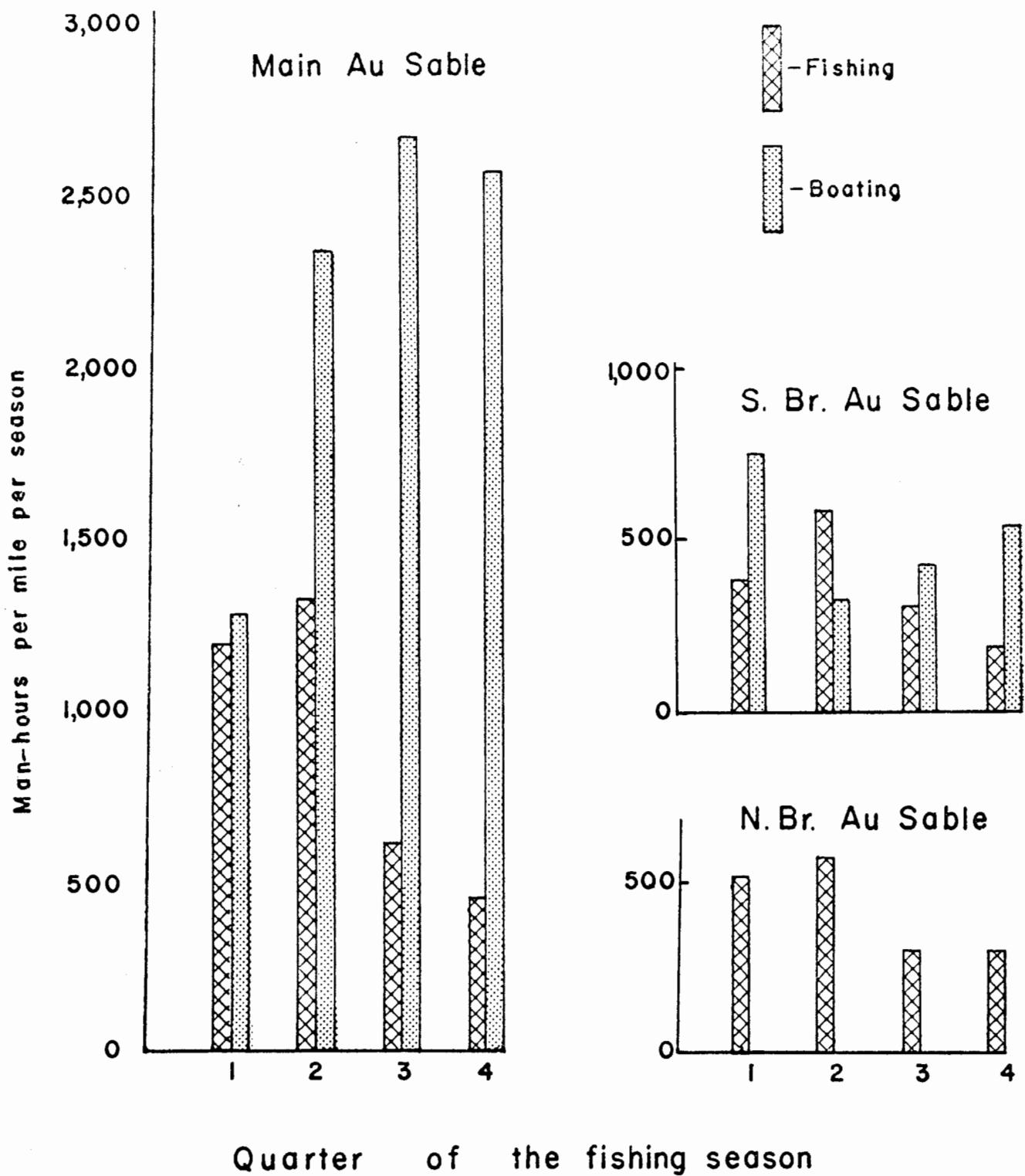


Figure 2. --Fishing and boating activity on three streams in the Au Sable River system during each quarter of the fishing season, expressed as average man-hours per mile, 1960-63.

Boating activity was more than four times as heavy on the Main Au Sable as on the South Branch. Comparatively speaking, boating was nearly nonexistent on the North Branch. Fishing was twice as intensive in the Main Au Sable when compared with the North Branch and 2.5 times more intensive than angling in the South Branch. It appears from the angler-use pattern that factors other than boating determined the seasonal use of the rivers by anglers.

The daily distribution of fishing and boating is shown in Figure 3. In all three streams there are three periods of peak angler activity every day. These peaks appear to result from anglers stopping to eat at noon and again at about 6 PM. Fishing activity is greatest in the evening on the Main Au Sable and South Branch whereas North Branch fishing is fairly uniform during the day; the explanation may be, in part, related to boating. There is little boating on the North Branch, while on the other two streams there is heavy fishing pressure during the evening after boat traffic has decreased. Apparently many anglers wait until recreational boaters are off the rivers before going fishing.

Angler and boater usage by day of the week is shown in Table 3. In general, Saturdays receive the most recreational activity and Sundays are second (Mondays for the North Branch). Relatively more boating than angling is done on the week ends. Sixty-one and 62%, respectively, of the boating on the Main Au Sable and South Branch was done on week ends, compared with 43 and 50% of the angling effort.

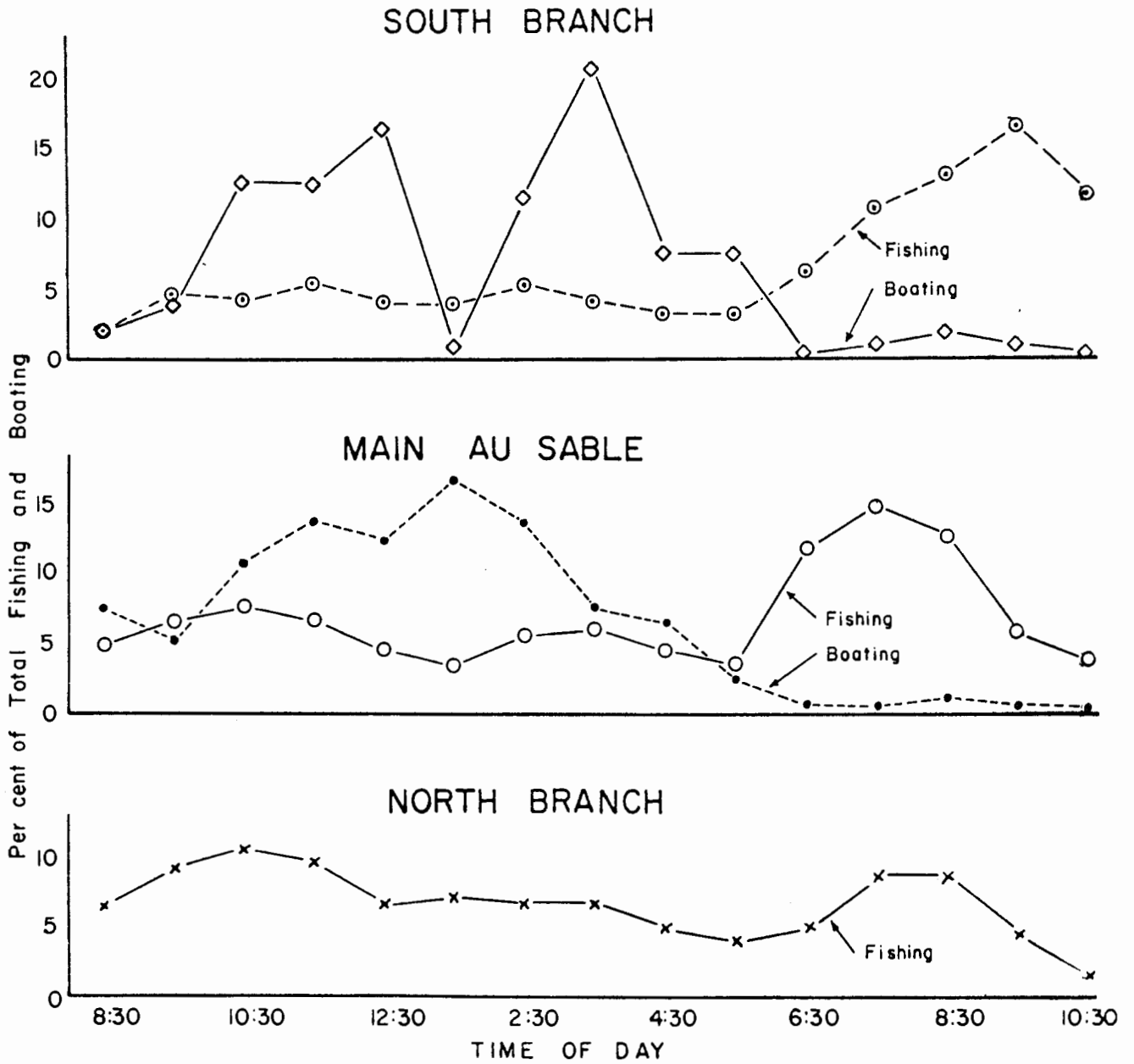


Figure 3. --Percentage of total fishing and boating activity on the Au Sable River system, 1960-63, at hourly intervals during the fishing day.

Table 3. --Percentage distribution of fishing and boating in the Au Sable River by day of the week

Day	Main Au Sable		South Branch		North Branch	
	Fishing	Boating	Fishing	Boating	Fishing	Boating
Monday	11.1	3.9	7.5	11.6	17.9	-
Tuesday	10.1	10.5	13.4	9.3	7.2	-
Wednesday	8.3	8.1	12.7	10.1	12.7	-
Thursday	13.9	7.6	4.8	3.5	10.2	-
Friday	13.6	8.8	11.3	3.7	16.0	-
Saturday	22.6	39.8	33.2	37.4	19.9	-
Sunday	20.4	21.3	17.1	24.4	16.1	-

At the present levels of recreational activity recorded during this study, there is little conflict between boaters and anglers in the usage of the North Branch since there is very little boating done on this stream. However, the South Branch and Main Au Sable are scenes of conflicting use between canoeists and anglers throughout the trout season, particularly in the last three quarters. ³

Residence of boaters and fishermen

Boaters and fishermen come from the same general areas of the state (Table 4). Wayne County contributed 23% of the boaters and anglers. Other metropolitan counties (Oakland, Genesee, Ingham, Washtenaw and St. Clair) furnished another 28%. The tri-county area of Bay, Midland and Saginaw contributed about 16% of the participants. About 11% of the contacts were local residents of Crawford and Roscommon counties. Relatively few recreationists came from counties west of I-75 or from Upper Peninsula counties.

Out-of-state recreationists made up about 10% of the total participants. Persons from 17 states and Canada were interviewed. The residence tabulations are based on 1,920 random interviews of boaters and 3,291 random interviews of anglers during 1960-63.

Adults and minors boating and angling

There was a pronounced difference in the proportion of adults and minors among boaters and anglers (Table 5). Only from

³ This conflict probably has intensified for the last quarter since the trout season now extends to the second Sunday in October on the special-regulation waters of the Main Au Sable.

Table 4. --Percentage distribution for residence of fishermen and boaters using the Au Sable River during 1960-63

County, state or country	Anglers			Boaters
	Main Au Sable	South Branch	North Branch	Main Au Sable + South Branch
<u>Resident</u>				
Allegan	-	-	-	0.05
Alpena	-	0.32	0.23	-
Antrim	0.15	-	-	-
Arenac	-	0.16	0.08	-
Baraga	0.07	-	0.08	-
Barry	0.22	-	0.08	-
Bay	4.24	9.13	4.42	4.58
Berrien	-	-	-	0.31
Branch	0.07	0.16	-	-
Calhoun	1.12	0.32	0.84	0.47
Charlevoix	-	-	-	0.42
Cheboygan	0.07	-	-	0.05
Clare	-	-	0.08	0.10
Clinton	0.97	-	-	0.52
Crawford	17.36	11.96	6.40	5.32
Eaton	0.67	-	0.23	0.10
Emmet	0.15	-	0.08	0.05
Genesee	6.33	8.97	6.17	4.23
Gladwin	0.07	0.16	-	0.16
Grand Traverse	0.22	0.16	-	0.27
Gratiot	2.08	-	0.15	0.31
Hillsdale	-	-	0.76	-
Huron	0.15	-	-	0.10
Ingham	6.63	5.82	2.06	6.68
Ionia	-	0.47	0.08	-
Iosco	0.22	0.16	-	-
Isabella	0.89	0.16	-	0.36

(continued)

Table 4. --continued

County, state or country	Anglers			Boaters
	Main Au Sable	South Branch	North Branch	Main Au Sable + South Branch
Jackson	0.89	0.94	1.14	1.88
Kalamazoo	-	-	0.84	0.47
Kent	2.83	0.32	1.29	0.26
Lapeer	0.52	0.16	-	1.15
Leelanau	0.37	-	-	-
Lenawee	0.15	-	-	0.31
Livingston	0.30	-	1.14	0.62
Macomb	2.01	0.79	1.29	0.57
Manistee	0.07	-	-	-
Marquette	0.60	-	-	0.10
Midland	1.04	4.41	1.14	5.16
Monroe	-	-	0.23	0.62
Montcalm	0.60	0.16	-	0.05
Montmorency	0.30	0.32	1.83	-
Muskegon	0.30	0.79	0.23	0.21
Newaygo	0.30	-	0.23	-
Oakland	6.71	14.33	12.25	14.11
Ogemaw	0.15	0.94	0.08	0.26
Oscoda	0.30	0.63	0.46	0.42
Otsego	-	-	3.66	0.10
Ottawa	-	-	0.23	0.10
Presque Isle	0.07	-	1.29	-
Roscommon	0.37	5.66	0.61	1.93
Saginaw	4.63	5.83	12.10	8.07
St. Clair	0.74	2.52	0.15	2.50
St. Joseph	-	-	0.15	0.10
Sanilac	-	0.47	0.08	0.99
Schoolcraft	0.07	-	-	-
Shiawassee	0.30	-	0.30	0.05
Tuscola	0.52	0.16	1.98	0.78

(continued)

Table 4. --concluded

County, state or country	Anglers			Boaters
	Main Au Sable	South Branch	North Branch	Main Au Sable + South Branch
Washtenaw	3.05	0.94	1.75	1.41
Wayne	19.14	16.06	20.33	25.36
Wexford	0.15	-	-	-
Totals	88.16	93.38	86.52	91.66
<u>Non-resident</u>				
Arizona	0.22	-	-	0.05
Arkansas	0.07	0.32	-	0.10
California	0.07	-	-	0.10
Colorado	-	0.32	-	-
Connecticut	-	-	0.15	-
Florida	-	-	0.08	-
Georgia	0.07	-	-	0.21
Illinois	1.20	0.16	0.61	0.89
Indiana	0.67	-	1.74	1.10
Missouri	-	-	0.08	0.05
New Jersey	0.07	-	0.08	-
New York	0.15	0.79	0.38	0.26
Ohio	8.20	4.24	9.98	4.64
Pennsylvania	0.67	0.79	0.15	0.05
Texas	-	-	-	0.05
Virginia	0.15	-	-	0.42
Wisconsin	0.15	-	0.15	-
Canada	0.15	-	0.08	0.42
Percentage non-resident	11.84	6.62	13.48	8.34

Table 5. --Percentage of adults and minors using the Au Sable River
for fishing and boating

Stream	Anglers		Boaters	
	Adults	Minors ¹	Adults	Minors ¹
Main Au Sable	93.5	6.5	-	-
South Branch	95.0	5.0	-	-
North Branch	96.6	3.4	-	-
Main Au Sable and South Branch	-	-	60.6	39.4

¹ Persons under 17 years of age.

3 to 7% of the anglers were found to be minors (persons under 17 years of age and not required to have a fishing license). Among boaters, 39% were minors.

Results of fishing

The fishing is discussed here to record the conditions observed in these portions of the Au Sable system today, and is not intended to be an evaluation of trout management practices.

The various stream sections studied were fished under three different sets of angling regulations. Normal Michigan trout rules (7.0-inch minimum legal length, 10-fish daily creel limit, any legal natural or artificial lure) were in force on the upper section of the Main Au Sable and alternately, as described below, for the upper and middle sections of the North Branch. On the South Branch and Main Au Sable (lower section) special regulations required a 10.0-inch minimum legal length, 5-fish daily creel limit, and lures restricted to artificial flies. For the upper and lower sections of the North Branch there was a 9.0-inch minimum legal length, 5-fish daily creel limit, and lures also restricted to artificial flies. On all but the North Branch the regulations were in effect continuously through 1960-63. On the North Branch, however, the regulations were reversed for the middle and upper sections beginning in 1961, but the lower section was continuously under special regulations. A summary of the angling data for the three streams is given in Table 6. Data collected in 1958 and 1959, as well as 1960 and

Table 6. --Angling statistics for certain waters in the Au Sable River system

Stream	Fishing regulation ¹	Hours fished per mile	Trout creeled per mile	Pounds of trout creeled per mile	Pounds of trout creeled per acre	Catch per hour
Main Au Sable	Normal	2,054	510	229	20.4	0.25
	Special	4,586	691	457	40.8	0.15
South Branch	Special	1,476	189	127	15.2	0.13
North Branch	Normal	2,217	1,041	333	28.7	0.47
	Special	1,169	168	90	7.8	0.14

¹ See text for explanation.

1963, were included to complete the statistics for the North Branch of the Au Sable.

On the special regulation portions of the three streams involved, the highest angler-use and also the greatest catch per mile was noted in the Main Au Sable. The South Branch experienced about one-third as much fishing as the Main Au Sable but slightly more than the North Branch. Average catch per mile per season in the North Branch and South Branch was similar. The catch per hour of trout was very similar for all of the special-regulation waters (approximately 0.14 trout per hour) although fishing pressure varied widely, and the North Branch had a lower minimum legal length. Based on usage per mile, catch per mile, and catch per hour, the Main Au Sable had better fishing in its special-regulation waters (Table 6) than in the special portions of the North Branch and South Branch.

Angling quality in the Au Sable waters fished under normal Michigan trout rules was quite different. Fishing success in the North Branch was much better than the fishing observed in the Main Au Sable, presumably because the middle section of the North Branch has better trout habitat than the upper section of the Main Au Sable.

Catch per hour by quarter of the season

Seasonal trends in the average catch per hour of trout for the various waters are shown in Figure 4. The catch per hour in the special waters of the Au Sable system generally declined throughout the season. Angling success increased somewhat during the second quarter for the

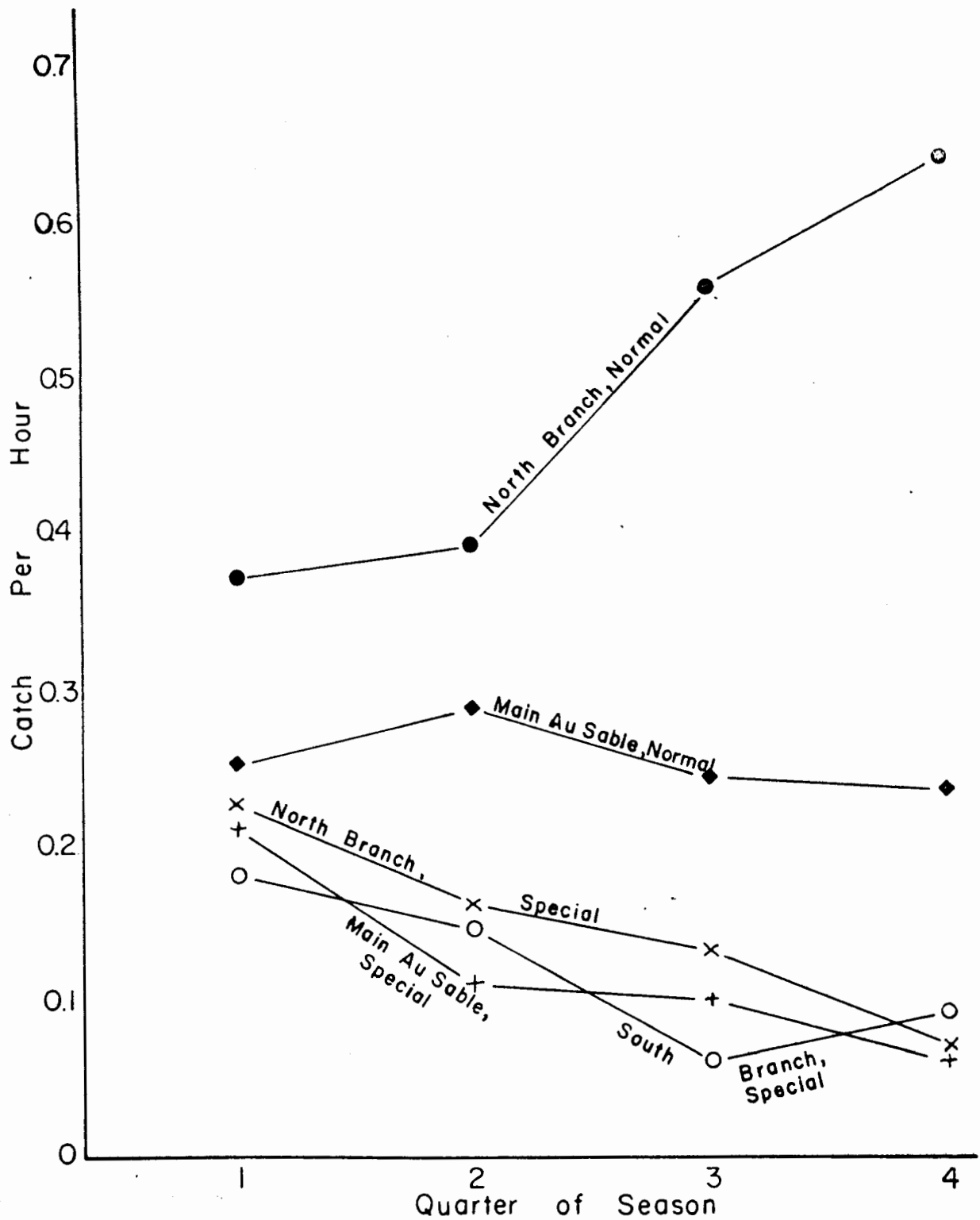


Figure 4. --Average catch of trout per hour, by quarter of the fishing season, in three streams in the Au Sable River system under normal and special fishing regulations, 1960-63.

normal waters of the Main Au Sable but then declined slightly during the last two quarters. Catch per hour increased throughout the season in the normal waters of the North Branch. This increase is due to the availability of many brook trout belonging to age group I attaining the legal size limit of 7 inches about mid-summer.

Species caught and size composition
of the catch

Angling on the North Branch is over wild populations of brook trout (Salvelinus fontinalis) and brown trout (Salmo trutta). The catch composition in the normal waters was 73% brook trout and 27% brown trout; in the special regulation areas, 36% brook trout, 64% brown trout (Table 7). The higher percentage of brook trout in the normal-water catches results from the lower minimum size limit. Under the higher size limit for the special-regulation waters (9.0 inches), many brook trout are not caught but die of natural causes. Also, many more trout (mainly brown trout) longer than 9.0 inches are caught per mile of stream fished under normal regulations than in the special-regulation waters. Few brook trout over 12.0 inches or brown trout larger than 20.0 inches are captured in the North Branch, regardless of fishing regulations.

South Branch fishing was entirely under special regulations and the catch was composed of both wild and hatchery trout. By species, about 50% were brown trout, 34% rainbow trout, and 16% brook trout. Most of the trout observed in the creels were in the 10- to 12-inch

Table 7. --The length distribution of trout caught by anglers in the various study sections of the Au Sable River system, expressed as average number per mile of stream

Stream section and regulation	Species of trout	Inch group														Totals
		7	8	9	10	11	12	13	14	15	16	17	18	19	21	
North Branch	Brook	456	221	70	12	2	2	-	-	-	-	-	-	-	-	763
Normal	Brown	35	35	51	56	44	20	5	6	10	9	2	2	1	2	278
	Totals	491	256	121	68	46	22	5	6	10	9	2	2	1	2	1,041
Special	Brook	-	-	49	11	0	1	-	-	-	-	-	-	-	-	61
	Brown	-	-	29	30	26	8	4	4	1	1	2	1	1	-	107
	Totals	-	-	78	41	26	9	4	4	1	1	2	1	1	-	168
South Branch	Brook	-	-	-	12	11	8	3	-	-	-	-	-	-	-	34
Special	Brown	-	-	-	35	25	14	6	6	9	-	1	-	-	-	96
	Rainbow	-	-	-	23	22	14	-	-	-	-	-	-	-	-	59
	Totals	-	-	-	70	58	36	9	6	9	-	1	-	-	-	189
Main Au Sable	Brook	65	37	22	3	-	-	-	-	-	-	-	-	-	-	127
Normal	Brown	19	9	62	41	37	15	12	25	3	9	3	3	-	-	238
	Rainbow	43	65	22	9	-	3	-	3	-	-	-	-	-	-	145
	Totals	127	111	106	53	37	18	12	28	3	9	3	3	-	-	510
Special	Brook	-	-	-	29	6	-	-	-	-	-	-	-	-	-	35
	Brown	-	-	-	292	142	84	55	29	16	3	6	3	-	-	630
	Rainbow	-	-	-	23	-	-	3	-	-	-	-	-	-	-	26
	Totals	-	-	-	344	148	84	58	29	16	3	6	3	-	-	691

group with relatively few larger trout seen. Brown trout at least 17.0 inches long were observed in creels, but larger fish are known to be in the stream.

Trout habitat in the Main Au Sable is strikingly different in the two sections, with the special section having the superior habitat. An unknown fraction of hatchery-reared trout may have entered the catch in the Main Au Sable, particularly in the normal section (upper) because this area was stocked annually. The special waters were not stocked directly, but upstream and downstream movement from stream sections that were planted was possible.

In the normal waters of the Main Au Sable the species composition of the observed catch was 47% brown trout, 28% rainbow trout (Salmo gairdnerii) and 25% brook trout. In the special-regulation water, brown trout made up 91% of the total catch, brook trout 5%, and rainbow trout 4%.

In general, the best fishing for trout over 10.0 inches long was in the lower section of the Main Au Sable, where the average annual catch per mile was 691. Fishing for trout larger than 10.0 inches in the Main Au Sable normal water, South Branch special water, and North Branch special and normal waters was at approximately the same level on a catch-per-mile basis. The greatest numerical catch per mile of trout larger than 7.0 inches was made in the normal waters of the North Branch.

Angler harvest in terms of total weight of trout caught reached a high of 457 lb. cropped per mile (40.8 lb. per acre) per year from the special-regulation area of the Main Au Sable. The lowest cropping rate was 90 lb. per mile (7.8 lb. per acre) annually from the North Branch special waters (Table 6).

Lures used in fishing

The fishing lures used on these streams were grouped into five categories, and their percentages of use are shown in Table 8. In the waters fished under special regulations (where flies were the only legal lure) over 90% of the fishing effort was with flies. Weighted spinning flies were used more frequently in the North Branch than elsewhere. A greater variety of lures was used in the "normal" waters. Natural lures were used more frequently than other kinds on the Main Au Sable and over one-third of the time on the North Branch. However, fly fishermen accounted for better than half of the angling on the normal waters of the North Branch and about one-quarter of that done in the Main Au Sable, even though special regulation areas were available on both streams within a short distance.

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Table 8. --Percentage distribution of fishing lures used on the Au Sable River, 1960-63¹

Stream	Fishing regulation	Fly	"Spin-fly"	Natural	Artificial	Combination
Main Au Sable	Normal	26.3	0.0	44.8	13.9	15.0
	Special	98.5	0.8	0.4	0.0	0.3
South Branch	Special	96.5	2.1	0.7	0.7	0.0
North Branch	Normal	55.4	0.3	36.0	1.6	6.7
	Special	92.2	5.3	2.5	0.0	0.0

¹ Fly = the commonly accepted artificial wet, dry, or weighted fly; Spin-fly = weighted fly thrown with spinning rod; Natural = worms, insects, minnows and other natural baits; Artificial = spinners, plugs, spoons, etc.; Combination = any combination of lures.

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