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A ONE YEAR (1933-1934) CENSUS OF SPORT FISHING ON FIFE LAKE, GRAND TRAVERSE COUNTY, MICHIGAN

Introduction

Due largely to the initial efforts of Commissioner Harold Titus, creel census was begun by the Michigan Department of Conservation in 1927. Since then the Department has conducted a creel census on many Michigan lakes and streams in order to determine the status of fishing. The general census has been taken by the conservation officers and by the fishermen. Naturally, statistics for all fishing could not be obtained, as only a small proportion of the fishing over the entire state could be checked. This "random sampling" has given a large amount of valuable information. A general cross-section of fishing in Michigan over a period of years is now available, and gives primarily the "catch per hour" for all species in each county. However, such factors as the total catch, the number of fish taken on the average by each fishermen, the time of day when fishing was done, and many other trenchant factors cannot be determined from this general creel census.

In the spring of 1933 the Civilian Conservation Corps was organized by the federal government. At that time numerous camps were established in Michigan as in some other states. The work carried on by these camps (Emergency Conservation Work) included from the beginning the general development and improvement of our aquatic resources.

During the winter of 1933-1934, a modified creel census was undertaken on 7 Michigan lakes by various Michigan C.C.C. Camps. This particular census was primarily taken to determine (1) the extent of winter fishing and (2) whether winter fishing

might adversely affect the summer fishing. Previous reports (265, 266 and 271) indicated the extent of winter fishing on these 7 lakes and partially indicated the effects of the winter fishing upon summer fishing.

In several instances this intensive creel census was again resumed on several lakes during the summer of 1934.

Fife Lake, the subject of this report, was one of the lakes upon which this summer creel census was conducted during 1934. The census presented certain difficulties not present to any extent in winter. Some of these difficulties were: (1) increased number of fishermen during the summer; and (2) greater difficulty in contacting the fishermen.

Fortunately the creel census crew from Fife Lake Camp mostly overcame these two obstacles by careful work, and so conducted its census that quite reliable data were available at the end of the year of census taking. The present report is based on this information.

This census was under the general supervision of Camp Superintendent A. L. Ferris and Foreman Erwin Moody. It was under the immediate supervision of Assistant Leaders C. Jorgensen and Grant Ruse. All of these men and their crews deserve to be commended for their work.

The census was conducted for exactly one year (December 21, 1933 to December 20, 1934) excepting of course, from April 30 to June 25 when the fishing in this lake was prohibited by law.

The fishing is here considered under 4 groups: (1) summer fishing, from June 25th to September 30th[1]; (2) fall fishing, from October 1st to November 30th; (3) winter fishing, from December 1st to April 30th; and (4) total fishing, representing the fishing throughout the entire year.

In this report only those creel census returns were included, which were virtually complete. This data came from fishermen directly contacted.

[1] For convenience, the entire month of September was included in the summer fishing.

Fortunately, it was necessary to discard only 32 of the 2431 creel census cards because of incomplete data.

Method of taking census during the various seasons

As explained in Report 266, the winter census was taken by approaching each fisherman at or near the close of his fishing day. The census takers from the C.C.C. Camp were equipped with a movable headquarters which could be changed to the most advantageous location. As the fishermen were relatively few in number, only a small crew was needed to make all necessary contacts.

During the summer and fall the census takers patrolled the shore, each having a definite amount of shoreline. This method was considered more practical than using boats and visiting the fishermen as they fished, for by patrolling the shores, the fishermen were contacted only after they had finished the day's fishing.

The census taking crew varied in number from 2 to 7 men, the total number for a given day depending on the intensity of fishing. The hours for the entire year were from daylight to dark. Apparently the amount of night fishing was small, and was directed primarily toward catching bullheads. Night fishing is therefore not considered in this report.

Throughout the year the crew kept records of the number of fishermen seen each day, the number of fishermen contacted and the general weather conditions.

It is assumed that all fishermen fishing during daylight hours were seen, for the crew was of adequate size and the lake more or less circular in shape, thereby making it possible for the crew to constantly have the entire lake under observation. Data were obtained from all fishermen seen in the fall and winter, though 3 of the fall data sheets were lost. (Because of the loss of these records, these three fishermen are considered in this report as not having been contacted.) In the summer, 149 fishermen were seen, though not contacted; consequently no other data from them were obtained. Thirty-two data sheets were minus some of the desired information. They were added to the 149 not contacted, making a total of 181 fishermen from whom complete information was unavailable. The number not contacted was after all surprisingly small, when the

difficulties in interviewing each individual fisherman are considered.

The creel census crews were equipped with special questionaires, which give the following information regarding each fisherman: (1) name, (2) sex, (3) number of lines (or spear), (4) number of fish of each species and average length of catch, (5) method of fishing, whether from ice, boat, or shore, (6) whether casting, trolling, or still fishing, (7) type of bait used, (8) prevailing weather conditions, (9) numbers of hours fished, (10) time of day fished, (11) period of day when fishing was best. Blanks used during the later part of the season also gave the address and approximate age of the fisherman. (A copy of the more recent data sheet is attached to this report.)

Description of Fife Lake

A physical, chemical and biological survey of Fife Lake has not been made by the Institute for Fisheries Research. Therefore, the following statements, relative to the several characteristics of the lake, are based on casual observations only. It is hoped that it will be possible to make a thorough survey of this lake in the future.

Fife Lake is located on M 131, mostly in the eastern part of Grand Traverse County, though a small portion extends into Kalkaska County. On its northwestern shore is situated the village of Fife Lake. The resort development is quite extensive, consequently fishing accessories, such as boats, fishing tackle and bait are readily available. The lake is also readily accessible for fishing at all seasons of the year, as it is located on one of the principal north and south highways.

According to the Michigan Lakes and Streams Directory, the area of Fife Lake is 800 acres. Evidence indicates that this is in all probability only an estimate and not an actual survey so this area must therefore be considered unsuitable as a basis for accurately determining the catch per acre.

The lake contains islands and relatively extensive shoal areas and is connected with the Manistee River by a small outlet. The aquatic vegetation is moderately plentiful. The abundance of fish food, indicates that it can adequately support a relatively large fish population. Due to the favorable conditions the lake is one of the better fish producing lakes in upper Michigan.

Weekly
Table I. Analysis of fishing on Fife Lake, summer and fall of 1934.

Number of fishermen, number of lines, fishermen per day, number and percent of fishermen taking no fish.

Date	Number of fishermen				Total lines used	Lines per person	Fishermen taking no fish			
	♂	♀	total	per day			♂	♀	total	%
June 25-30	103	18	121	20	145	1.2	22	4	26	21.5
July 1-7	139	23	162	23	170	1.05	39	7	46	28.4
July 8-14	168	56	224	32	228	1.0	59	15	74	33.0
July 15-21	164	25	189	24.1	197	1.04	47	4	51	27.0
July 22-28	191	50	241	34.4	257	1.08	29	10	39	16.2
July 29-Aug. 4	215	49	264	37.8	276	1.05	71	8	79	29.9
Aug. 5-11	204	54	258	37	280	1.09	54	6	60	23.2
Aug. 12-18	180	79	259	37	283	1.09	32	13	45	17.4
Aug. 19-25	82	36	118	17	130	1.1	22	9	31	26.2
Aug. 26-Sept. 1	136	66	202	29	214	1.06	40	17	57	28.2
Sept. 2-8	87	30	117	16.7	124	1.06	26	6	32	27.3
Sept. 9-15	83	34	117	16.7	123	1.05	16	8	24	20.5
Sept. 16-22	45	24	69	9.9	72	1.04	5	2	7	10.1
Sept. 23-29	25	17	42	6	47	1.1	4	3	7	16.7
Sept. 30	13	3	16	16	16	1.0	0	0	0	0.0
Totals	1835	564	2399	24.48	2562	1.068	466	112	578	24.09
October	130	60	190	6.1	231	1.22	22	6	28	14.7
November	6	2	8	.27	10	1.25	3	1	4	50.0
Totals for Oct. and Nov.	136	62	198	3.24	241	1.22	25	7	32	16.2

Analysis of the summer fishing

The summer fishing season officially began on June 25th. (All fishing to and including September 30th is here considered as summer fishing. All computations are on a weekly basis, except for June 25 to June 30, a period of 6 days).

An analysis of the summer fishing follows:

Number of fishermen — Table I indicates that 2399 fishermen were contacted. The number of fishermen actually noted, however, was slightly over 2500. The table also indicates that to mid-September (14 weeks), the weekly number of fishermen was over 100, and that for about half of this number of weeks it was over 200. The heaviest fishing was from approximately mid-July to mid-August.

Of the total number of people fishing, 564 (23.5%, or almost 1/4) were women. Curiously enough, the proportion of men to women does not remain constant from week to week. For instance, only 13% were women during the week of July 23-29, while 40% were women during September 23-29. The reason for this inconsistency is unknown although it may be due to the fact that women are more sensitive to adverse weather conditions.

The daily average number of fishermen of both sexes for the entire season (98 days) was 24.48.

Number of lines used — Table I shows that only 7 fishermen in every 100 used the two lines permitted. The number using 2 lines fluctuated in an irregular manner.

Fishermen getting no fish — The number of fish each individual fisherman caught has not been determined, though the number of fishermen taking no fish, and the number taking the maximum limit are here recorded. Table I shows for each week, the total number of fishermen taking no fish, the number of each sex (of fishermen) taking no fish and the percentage of the fishermen taking no fish. The figures disclose several interesting facts:

(1) Approximately 1/4 (24.09%) of all fishermen caught no fish.

(2) Of those taking no fish 80.6% were men and 19.4% were women. (Of the total number of fishermen fishing the lake 76.5% were men and 23.5% were women). In proportion there were fewer women (about 5%) than men who took no fish. This does not

mean, of course, that the average woman took more fish or so large a fish, as did the average man.

(3) There appears to be very little correlation between the number of persons fishing in any given week and the number catching no fish. In the "200 fisherman per week group" the percentage taking no fish varied from 16.2 to 33%. The weekly fluctuation is therefore quite irregular. For the summer season, the average percentage of persons catching no fish was 24.09. The percentage catching no fish was 24.6 during those 6 weeks when the greatest amount of weekly fishing was done.

Limit catches — No legal limit catches of northern pike or walleye (yellow pike-perch) were taken. Legal limit catches (or over) of bass and pan fish were relatively few. They are listed below, together with the type of bait used:

Month	No. of fish taken	Species of fish	Bait used
June	25	mostly rockbass	several baits
"	5	smallmouth bass	" "
"	7	" "	" "
"	5	largemouth bass	worms
"	6	smallmouth bass	live baits
"	6	" "	worms
"	5	largemouth bass	"
July	35	mostly perch	several baits
"	25	varied	worms
"	38	sunfish	"
"	5	smallmouth bass	minnows
"	5	" "	"
"	8	" "	"
"	5	" "	spinner
"	6	" "	minnows
"	5	" "	worms
"	5	" "	worms and minnows
"	5	" "	minnows
"	6	" "	several baits
"	5	" "	minnows
"	5	" "	"
"	5	largemouth bass	worms
"	6	" "	grasshoppers
August	25	varied	minnows
"	31	"	worms
"	5	smallmouth bass	minnows
"	5	largemouth bass	"
September	35	mostly perch	"
"	30	" "	"

September	30	perch	minnows
"	25	varied	"
"	5	smallmouth bass	"
"	5	" "	several baits
"	5	" "	several baits
"	5	" "	worms

It will be noted from the above that 35 fishermen took the limit or over. Ten of these fishermen took the limit in pan fish, while the remainder caught the limit or more in bass (primarily smallmouth). Therefore between one and two percent of the fishermen caught the maximum limit or over. Except for one limit catch of bass on a spinner, all limit catches were taken on natural bait (where only one kind of bait was used). Among natural baits, minnows ranked first, worms second, while grasshoppers were a poor third.

Number of fish taken (Table II) — A total number of 10,656 fish were taken by 2399 fishermen.

Table II shows: (1) the number of fish taken each week; (2) that for three weeks, over 1000 fish per week were taken; (3) that the lake produced, on the average over 100 fish per day for the entire 98 days; (4) that the number per week dropped decidedly after mid-September.

Fish taken per hour — Table II also shows; (1) the fish that were taken per hour for each week; (2) that by comparison with Table I, the week when the greatest number of persons fished (July 29 to August 4) was the week the fewest fish per hour were taken; (3) that fishing was best near the beginning and end of fishing season, and poorest when the greatest amount of fishing was done (due to hot weather or lack of skill of tourists?); (4) that for the entire season the catch per hour was 1.72 fish.

Number of fish taken per fisherman — Table II indicates: (1) that the average fisherman took about 4 1/2 fish each fishing day (2.6 hours); (2) that the average fisherman fished a rather uniform length of time irrespective of the number of fish caught per hour.

Average size of all fish taken — Table II also indicates: (1) that the average total length for all species of fish (recorded below) for the entire season was 8 1/3 inches; (2) that there was no gradual reduction in the average size

Table II. Weekly analysis of fishing on Fife Lake, summer and fall of 1934.

Number of fish, fish per hour, fish per fisherman, average size of all fish,

Date	No. of fish taken	Fish per hour	Fish per angler	Average size of fish (in.)
June 25-30	629	2.0	5.2	8.95
July 1-7	847	2.25	5.2	8.7
July 8-14	896	1.66	4.0	8.4
July 15-21	980	2.03	5.2	8.7
July 22-28	1302	1.95	5.4	8.3
July 29-Aug. 4	918	1.24	3.5	8.4
Aug. 5-11	1143	1.77	4.5	8.1
Aug. 12-18	1083	1.7	4.2	7.85
Aug. 19-25	488	1.78	4.1	7.8
Aug. 26-Sept. 1	683	1.44	3.4	8.3
Sept. 2-8	370	1.29	3.2	8.0
Sept. 9-15	535	1.56	4.6	7.9
Sept. 16-22	464	1.9	6.7	8.2
Sept. 23-29	208	1.81	4.5	8.5
Sept. 30	110	2.0	6.9	8.8
Total or Average	10656	1.72	4.44	8.33+
October	1275	2.46	6.7	8.4
November	31	1.8	3.9	7.7
Total or Average	1306	2.43	6.6	8.0

during any period throughout the entire season (this applying to all species collectively), (3) that during the summer there were caught a total of 88,828 inches of fish (approximately 1.4 miles).

Analysis of the catch (Table III) The catch of all species of fish taken totalled twelve, of which three species (Calico Bass or Black Crappies, suckers and large minnows or shiners) were of little significance. Consequently these latter three are not included in Table III.

The twelve species of fish named in the following list are given in the order of their abundance in the catch; the Yellow Perch being the most abundant.

Yellow perch - Perca flavescens

Rockbass - Ambloplites rupestris

Bluegill - Helioperca macrochira

Pumpkinseed sunfish - Eupomotis gibbosus

Smallmouth bass - Micropterus dolomieu

Bullheads - Ameiurus spp? (either nebulosus or natalis or both)

Largemouth bass - Aplites salmoides

Yellow Pike-perch or Walleye - Stizostedion vitreum

Northern pike - Esox lucius

Calico bass - Pomoxis sparoides

White sucker - Catostomus commersonnii commersonnii

Large minnow or shiner, probably the Golden shiner - Notemigonus crysoleucas auratus

It should be noted that (1) over 1/2 the total catch consisted of perch and rockbass; (2) over 1/3 of the total catch were perch; (3) the four larger and most desired fish, namely, largemouth bass, smallmouth bass, walleye and northern pike, constituted only 1/8 (12.6%) of the entire catch; (4) the weekly average size for any one species remained constant as the season progressed.

A brief discussion of each species follows:

1. Smallmouth bass. Table III shows that the smallmouth bass constituted a significant portion (9.3%) of the total catch. There were taken daily from the lake an

Table III. Weekly analysis of the catch for Fife Lake, summer and fall of 1934.

Including all species except the least significant species.
(Calico bass, suckers and shiners).

Date	Smallmouth bass				Largemouth Bass				Bluegill				Sunfish			
	No.	Av. size	% total	per hr.	No.	Av. size	% total	per hr.	No.	Ave. size	% total	per hr.	No.	Ave. size	% total	per hr.
June 25-30	80	12.3	12.7	.25	37	13.2	5.9	.12	67	7.1	10.7	.21	37	7.1	5.9	.12
July 1-7	73	12.0	8.6	.19	37	13.5	4.4	.10	136	7.2	16.1	.36	40	7.2	4.7	.11
July 8-14	76	12.2	8.5	.14	14	15.3	1.5	.03	110	7.0	12.3	.20	62	6.7	7.0	.11
July 15-21	86	12.1	8.7	.18	32	15.1	3.3	.07	231	7.5	23.5	.47	76	6.9	7.8	.16
July 22-28	162	12.1	12.4	.24	19	15.1	1.5	.03	251	7.2	19.3	.38	133	6.8	10.2	.20
July 29-Aug. 4	128	12.1	13.9	.17	14	14.3	1.5	.02	141	7.3	15.4	.19	131	7.2	14.3	.18
Aug. 5-11	82	12.3	7.2	.13	28	12.2	2.5	.04	306	7.6	26.8	.48	148	6.7	12.9	.24
Aug. 12-18	60	12.3	5.5	.09	40	12.8	3.4	.06	346	7.1	31.9	.54	114	6.7	10.5	.18
Aug. 19-25	25	11.3	5.1	.09	15	11.7	3.1	.05	85	7.0	17.4	.30	46	6.9	9.4	.16
Aug. 26-Sept. 1	72	11.8	10.5	.15	21	13.7	3.6	.05	70	7.3	10.2	.15	74	6.8	10.8	.16
Sept. 2-8	36	11.8	9.7	.13	6	12.3	1.6	.03	18	7.1	4.9	.06	23	6.5	6.2	.08
Sept. 9-15	40	13.2	7.5	.12	9	12.9	1.7	.03	55	6.8	10.3	.16	24	7.0	4.5	.07
Sept. 16-22	41	13.0	8.8	.17	12	11.4	2.6	.05	103	7.0	22.2	.47	48	6.8	10.3	.20
Sept. 23-29	19	13.8	9.1	.17	7	14.1	3.0	.06	31	7.6	14.9	.27	28	6.5	13.5	.24
Sept. 30	12	14.8	10.9	.22	3	14.7	2.7	.05	20	6.8	18.2	.36	32	6.3	29.1	.58
Total or Ave.	992	12.25	9.31	.16	294	13.48	2.76	.04	1970	7.22	18.49	.32	1016	6.83	9.53	.16
Per day N/98	10.1				3.0				20.1				10.4			
October	49	14.5	3.8	.09	23	13.7	1.8	.04	79	7.5	6.2	.15	8	7.1	.6	.02
November	1	10.0	3.2	.06	..	..	..	..	1	7.0	3.2	.06	2	7	6.5	.12
Totals	50	14.4	3.8	.09	23	13.7	1.8	.04	80	7.5	6.2	.15	10	7.1	.8	.02

Date	Rockbass				Perch				Walleye				Northern pike		Bullhead	
	No.	Av. size	% total	per hr.	No.	Av. size	% total	per hr.	No.	Av. size	% total	per hr.	No.	Av. size	No.	Av. size
June 25-30	140	8.7	22.3	.44	239	7.4	38.0	.76	14	19.0	2.0	.04	2	21.0	9	10.0
July 1-7	148	8.2	17.5	.39	349	7.3	41.2	.93	26	19.9	3.1	.07	3	24.7	35	11.0
July 8-14	152	7.9	17.0	.28	418	7.3	46.7	.77	28	20.8	3.1	.05	6	19.5	30	9.9
July 15-21	178	8.8	18.2	.37	330	7.6	33.7	.68	19	17.8	1.9	.04	3	23.0	25	9.2
July 22-28	267	7.5	20.5	.40	358	7.6	27.5	.54	3	16.2	.2	..	2	21.5	107	10.5
July 29-Aug. 4	197	7.6	21.5	.27	287	7.6	31.3	.39	6	23.9	.6	.01	2	18.5	12	11.6
Aug. 5-11	276	7.6	24.1	.43	265	7.4	23.2	.41	8	21.6	.7	.03	9	19.1	21	10.5
Aug. 12-18	247	7.5	22.8	.39	220	7.1	20.3	.34	7	18.9	.6	.01	2	18.0	42	11.2
Aug. 19-25	114	8.0	23.4	.40	199	7.2	40.8	.70	2	23.0	.4	.01	..	..	1	12.0
Aug. 26-Sept. 1	184	8.1	26.9	.39	253	7.5	37.0	.53	2	24.5	.3	..	2	23.5	5	9.6
Sept. 2-8	74	7.9	20.0	.26	204	7.5	55.0	.71	1	28.0	.3	..	6	24.5	2	11.5
Sept. 9-15	87	7.6	16.2	.25	299	7.1	55.9	.87	1	18.0	.2	..	4	18.7	9	10.5
Sept. 16-22	47	7.6	10.2	.20	207	7.7	44.6	.88	1	25.0	.2	..	3	27.3	1	10.0
Sept. 23-29	14	7.8	6.7	.13	95	7.9	45.7	.83	1	18.0	.5	.01	..	..	3	12.0
Sept. 30	4	7.0	3.6	.07	34	7.8	30.9	.61	..	..	..	..	4	26.0	1	12.0
Total or Ave.	2129	7.9	20.0	.34	3757	7.4	35.24	.61	119	20.1	1.12	.02	48	21.8	303	10.5
Per day N/98	21.7				38.33				1.2				.49		3.1	
October	68	8.0	5.3	.13	1035	8.0	81.2	1.99	4	20	.3	.01	6	22.2	3	11.3
November	3	8.0	9.7	.18	23	7.4	74.2	1.35	..	..	..	..	1	14.0	...	..
Totals	71	8.0	5.4	.13	1058	8.0	80.0	1.97	4	20	.3	.01	7	21.9	3	11.3

average number of 10.1 for the entire season, or about one bass per 2 1/2 fishermen.

The number taken weekly and the percentage of the total catch varied considerably, while the average size remained more or less constant.

Smallmouth bass were taken in much larger numbers than were any other species of equal or larger size.

The catch per hour was best during the first week of the season; the fisherman taking on the average one bass per 4 hours of fishing. The readiness with which the bass bit at this time may be due to the fact that spawning had been relatively recent, and the male bass were probably feeding heavily after having fed little while guarding their nests. In mid-August the catch was as low as one bass per 11 hours of fishing. It could not be determined what portion of the total fishing was directed toward the catching of this species.

2. Largemouth bass. This species constituted 2.8% of the total catch. The proportion between smallmouth and largemouth bass was about 3 1/2 to 1. The largemouth had an average size of 13 1/2 inches and were taken at the average rate of 3 per day.

3. Bluegill. The lake produced an average number of slightly more than 20 bluegills per day. These fish had an average length of about 7 1/4 inches, constituted 18.49% of the total catch and were taken at the rate of 1 for every 3 hours of fishing. The best bluegill fishing was in mid-August at a time when the intensity of fishing was near its height. For several weeks bluegills ranked first in number of fish taken. In general a considerable weekly irregularity exists in the number of fish taken, percentage of total catch and the catch per hour.

4. Sunfish. Evidence indicates that virtually all of the sunfish other than bluegills were pumpkinseed sunfish. The average size of these was under 7 inches. The records show that there were nearly twice as many bluegills taken as there were sunfish. Weekly fluctuations of sunfish and of bluegills seemed to have little in common.

5. Rockbass. The rockbass showed considerable weekly uniformity in numbers from the beginning of the season until early in September, after which the numbers declined rapidly. This species rated only a little higher in total catch than did the bluegills.

Yellow
6. Perch. Throughout the greater part of the summer season, perch rated first in number taken. The perch catch, based on fish per hour, shows peaks in early July and in September (when the weather was particularly cool). The weekly catch was at its lowest in mid-summer and at the time when bluegill and rockbass fishing were near their height for several consecutive weeks in August. Perch ranked in third place, as regards weekly numbers taken; although, for the entire season this species was decidedly in first place. The average summer size of the perch was about 7 1/2 inches.

7. Walleye. Walleyes, or yellow pike-perch constituted slightly more than 1 percent of the total catch despite the fact that they were much sought after. Walleye fishing was decidedly at its best during the first 4 weeks of the fishing season (June 25 to July 21). During the major portion of the tourist season the catch was reduced to practically nothing. The species had a fair average size (20 inches).

8. Northern pike. The northern pike catch throughout the summer was fairly uniform though of small size for that species. The total pike catch (total number of 48 pike for 98 days) was very insignificant, for it constituted less than .05% of the total catch. In fact, there was taken less than 1 pike for every 100 hours of fishing.

9. Bullhead. The data for the bullhead catch are the least dependable, since some night fishing for this species was done, when no census takers were present. However, the figures given seem to include most of the bullheads taken. At least this is the concensus of opinion of those taking the census. Bullhead fishing showed a decided decline after July. These fishes were of a good average size (10 1/2 inches) throughout the season. They constituted less than 3% of the total fish catch for the summer season.

10. Calico Bass. The calico bass or black crappies were of fair size, but were few in number, as only 15 were taken during the entire season.

11 & 12. Suckers and shiners. The catch of suckers and shiners was too meager (9 and 4 respectively) to be regarded as significant.

Hours fished (summer season) Table IV shows (1) that the total number of fishing hours was 6187.75 (equivalent to 1 man fishing continually 24 hrs. per day for 258 days, or equivalent to 1 man fishing the average fisherman

Table IV. Fishing on Fife Lake, summer and fall of 1934.

Hours fished and hours per fisherman

Date	Total hours	A.M.	P.M.	Time not given	Hours per fisherman
June 25-30	316.5	88.5	228	...	2.6
July 1-7	376.0	213.0	161.5	1.5	2.25
July 8-14	539.5	184.0	353.5	2.0	2.4
July 15-21	484.0	224.0	260.0	...	2.6
July 22-28	665.5	300.75	360.75	4.0	2.8
July 29-Aug. 4	739.25	279.0	455.75	4.5	2.8
Aug. 5-11	644.5	207.0	437.5	...	2.5
Aug. 12-18	628.0	233.0	396.0	...	2.4
Aug. 19-25	284.25	112.25	170.0	2.0	2.4
Aug. 26-Sept. 1	474.75	179.5	291.75	3.5	2.35
Sept. 2-8	286.75	90.0	196.75	...	2.45
Sept. 9-15	342.0	66.5	275.5	...	2.9
Sept. 16-22	235.0	104.0	131.0	...	3.4
Sept. 23-29	115.25	53.75	61.5	...	2.7
Sept. 30	55.5	18.5	37.0	...	3.5
Totals or Averages	6187.75	2353.75	3816.5	17.5	2.6
October	519.0	135.5	383.5	...	2.7
November	17.0	3.5	13.5	...	2.1
Totals or Averages	536.0	139.0	397.0	...	2.7

day for Fife Lake (2.6 hours) for 2380 days or about 6 1/2 years), (2) the fishing was heaviest from mid-July to mid-August, (3) slightly more than 1/3 of all fishing (38%) was in the morning, (4) the daily fluctuation between morning and afternoon fishing was pronounced. Weather apparently was the chief factor responsible for this daily fluctuation.

Hours per fisherman (summer season) The average number of hours each person fished daily varied little throughout the summer season. The number of hours is smaller than might have been expected. It is evident that fishing on this lake in 1934 did not occupy the major part of the fishermen's time.

Time of day fished Table V shows the catch for each hour fished in actual figures and in percentages. Graph 1 indicates that there are two peaks in the day's fishing, one in the morning, the other in the late afternoon. Fishing in the morning is greatest between 8 and 11 A.M.; dropping very decidedly between 12 (noon) and 2 P.M.; then rising again to reach its greatest height for the day at 6 to 7 P.M.; after which the decline was very rapid. Fishing by most people is usually considered best soon after daylight and toward twilight; at Fife Lake many fishermen fished in the evening and very few in the early morning. Over 10% of the fishing was between 6 and 7 P.M.

Time of day most favorable The creel census questionaires show (1) what hours people fished and (2) during what hours the most fish were caught. Naturally those fishermen who took no fish had no "best fishing" hours, while others who took only a few fish would be unable to indicate the most favorable ~~fish~~ time. The conclusions reached as to when fishing was the most favorable during each fisherman's day was based on the given period of time when the most fish were taken, and not on the fisherman's personal opinion. Graph 1 shows (1) the percentage of hours fished, (2) the percentage of hours when fishing was most favorable and (3) that most of the people fished at that time of day when fishing was the poorest.

Summer fishing compared with tourist numbers Creel census sheets used for the major portion of the season unfortunately did not indicate the address of the fishermen. (Later on in the season these blanks were revised to include the address of

Table V. Fife Lake, summer and fall of 1934 - time of day fished.

Date A.M.:	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	Total
June 25-30	1	4.0	12.0	15.5	14.0	15.5	10.0	9.0	7.5	88.5
July 1-7	...	1.5	7.5	24.0	44.0	41.0	36.5	34.0	24.5	213.0
July 8-14	...	...	.5	9.5	32.5	32.5	34.5	38.0	36.5	184.0
July 15-21	...	...	9.0	20.5	32.5	50.5	51.0	39.5	21.0	224.0
July 22-28	1	2.5	9.5	27.0	59.0	72.0	58.75	40.0	31.0	300.75
July 29-Aug. 4	...	.5	12.0	32.0	52.5	59.5	47.5	43.5	31.5	279.0
Aug. 5-11	...	.5	4.0	23.5	35.0	38.5	43.5	33.0	29.0	207.0
Aug. 12-18	...	...	1.0	9.0	29.5	49.25	56.5	52.75	35.0	233.0
Aug. 19-25	...	...	...	3.0	14.5	30.0	28.0	22.5	14.25	112.25
Aug. 26-Sept. 1	...	...	.5	3.5	15.0	31.0	34.0	49.0	46.5	179.5
Sept. 2-8	...	...	...	1.5	4.0	18.0	16.5	23.0	27.0	90.0
Sept. 9-15	...	...	...	...	3.0	7.5	15.5	20.0	20.5	66.5
Sept. 16-22	...	...	3.0	5.0	11.0	14.0	18.5	21.5	31.0	104.0
Sept. 23-29	...	...	...	1.0	...	3.0	11.0	20.0	18.75	53.75
Sept. 30	...	...	...	...	...	...	4.0	7.0	7.5	18.5
Totals	2	9.0	59.0	175.0	346.5	462.25	465.75	452.75	381.5	2353.75
%	.03	.15	.95	2.83	5.60	7.47	7.53	7.32	6.16	38.0
October	...	...	...	...	...	8.0	32.5	50.0	45.0	135.5
November	...	...	...	...	...	1.0	.5	1.0	1.0	3.5
Totals	...	...	...	...	...	9.0	33.0	51.0	46.0	139.0
% of A.M.	...	...	...	...	...	6.7	6.2	9.5	8.6	26.0

Date P.M.:	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	Totals
June 25-30	11.0	22.0	28.0	29.0	30.0	32.0	29.5	26.5	20.0	...	...	228.0
July 1-7	10.0	10.5	14.0	22.0	16.5	12.5	24.5	27.5	22.0	2.0	...	161.5
July 8-14	10.5	12.5	21.5	30.5	41.5	47.5	64.0	76.5	45.0	4.0	...	353.5
July 15-21	12.5	18.0	23.0	33.5	28.0	37.5	48.0	36.0	20.5	3.0	...	260.0
July 22-28	23.75	17.0	21.5	32.75	48.0	60.5	65.0	57.25	24.0	9.0	2.0	360.75
July 29-Aug. 4	22.0	30.5	34.5	43.5	57.5	75.5	88.75	68.5	32.5	2.5	...	455.75
Aug. 5-11	24.0	27.75	30.25	39.5	52.25	71.75	84.5	72.5	32.5	2.5	...	437.5
Aug. 12-18	20.0	14.0	15.5	23.5	44.0	74.25	93.5	77.5	28.75	3.5	1.5	406.0
Aug. 19-25	9.0	10.0	17.5	22.0	22.5	28.5	31.0	21.0	7.0	1.5	...	170.0
Aug. 26-Sept. 1	37.0	29.5	34.0	33.25	50.0	54.0	37.0	15.0	2.0	...	...	291.75
Sept. 2-8	24.0	21.0	20.5	25.0	33.0	32.0	27.75	13.5	...	...	...	196.75
Sept. 9-15	10.5	18.0	44.5	58.5	54.5	45.0	32.0	12.5	...	...	...	275.5
Sept. 16-22	16.5	5.25	23.0	35.0	27.5	17.75	12.0	3.0	1.0	...	...	131.0
Sept. 23-29	10.5	11.0	12.5	11.0	6.5	5.5	3.5	1.0	...	...	...	61.5
Sept. 30	2.0	5.0	9.0	11.0	9.0	1.0	...	...	...	...	...	37.0
Totals	233.25	252.0	349.25	450.0	520.75	595.25	641.0	508.25	235.25	28.0	3.5	3816.5
%	3.77	4.07	5.64	7.27	8.42	9.62	10.36	8.21	3.80	.45	.06	62.0
October	37.5	51.5	66.5	85.5	83.0	43.0	16.0	.5	...	...	...	383.5
November	.5	4.0	3.0	...	2.0	2.0	2.0	...	...	...	...	13.5
Total	38.0	55.5	69.5	85.5	85.0	45.0	18.0	.5	...	...	...	397.0
% of P.M.	7.1	10.4	13.0	15.9	15.9	8.5	3.4	.1	...	...	...	74.0

the fishermen.) In future creel census work this information will be available. We will therefore be able to ascertain the numerical proportion of local to non-local fishermen.

In order to link fishing fluctuations on Fife Lake with the Michigan tourist fluctuations, figures on state park attendance were obtained from Mr. W. J. Kingscott, Superintendent of State Parks. Unfortunately Fife Lake has no state park in its immediate vicinity with which to directly correlate the fishing fluctuations with the tourist fluctuations (although a small public park does exist in the Fife Lake State Forest nearby). Due to this absence of a state park near Fife Lake an attempt was made to obtain the average weekly tourist fluctuations for the lower peninsula of Michigan. To do this, the Institute obtained from Mr. Kingscott's office, the percentage of increase and decrease in weekly attendance for 4 Michigan state parks, namely, Burt (average attendance), Aloha (smallest attendance), Interlocken (average attendance) and Grand Haven (largest attendance). Weekly attendance in actual figures was also provided for Burt Lake Park. These percentages in weekly attendance for these parks indicate clearly that the fluctuations vary considerably, both in the comparative attendance and for each individual park. If the fluctuations for the average of the 4 state parks are the fluctuations in tourist trade throughout Michigan, and on Fife Lake in particular, and if other factors are uniform, then it might be assumed that tourist fluctuations had little influence on the fishing on Fife Lake. However, other factors enter, such as weather conditions, which undoubtedly affect the fishing fluctuations more than do the tourist fluctuations. If figures from the resort at Fife Lake were available these might compare more favorably with the fishing on the lake, than do the tourist fluctuations.

Methods of fishing (summer season) All fishing on Fife Lake was done from boats. Some fishermen used several methods of fishing during a day while others used only one. Of the latter group there were 1919 who still fished, 221 who trolled and 66 who cast. These three methods are briefly discussed:

Trolling. The 221 fishermen who trolled took a total of 193 fish, an average of less than 1 fish for each fisherman. Almost half (102 fishermen, or 46%) took no fish.

The fish taken by trolling were large, consisting chiefly of walleyes, northern pike, bass and rock bass. These fish had an average length of 14.1 inches, which was almost twice as large as the average length of fish taken collectively by the other two methods.

Casting. Of the 66 fishermen who cast ~~only~~ 28 (42.4%) took no fish. The successful fishermen took 58 fish, which averages less than 1 fish per fisherman. The fish taken consisted of the following species: smallmouth bass, largemouth bass, rockbass, bluegills, walleyes, and perch. The average length of these fish was 12 1/2 inches.

Still-fishing. The 1919 fishermen who still-fished took a total of 9504 fish, an average of approximately 5 (4.95) fish for each day's fishing. One fifth (380 fishermen, 19.8%) took no fish. The fish taken by still-fishing included 7/8 of all fish taken during the summer. Pan fish dominated the catch. The fish caught by this method had an average length of 8.2 inches.

Summary of all methods of fishing

Method	Fishermen using each method*		Fish taken by each method	Fish per day's fishing	Ave. length of fish taken by ea. method	Fishermen getting no fish, by each method	
	No.	%				No.	%
Trolling	221	10	193	.87	14.1 in.	102	46
Casting	66	3	58	.88	12.5 in.	28	42.4
Still-fishing	1919	87	9504	4.95	8.2 in.	380	19.8

* There were 189 fishermen who used several methods in one day's fishing or who failed to indicate which method they used. These caught a total of 901 fish; 4.8 fish per fishing day; the fish had an average length of 8.7 inches.

From the above summary it can be seen (1) that still-fishing produced the most fish per fisherman, though the smallest in size; (2) casting produced about the same number of fish per fisherman as did trolling, though the fish were intermediate in size (between those taken by still-fishing and by trolling); (3) trolling produced the largest fish and (by a very small margin over casting) the fewest fish per fisherman. Therefore, the chance of getting a fish by trolling or casting was poor when compared with still-fishing, but the fish taken by the former two methods averaged very much larger.

Fall Fishing

Fall fishing, as here considered, was restricted to October and November. October fishing was quite different from the summer fishing, in that one species, perch, decidedly dominated. November fishing was negligible (8 persons).

Number of fishermen — The total number of fishermen in October (190) was only a little higher than the average weekly number during the previous summer season (considerably less than the weekly number of fishermen for almost every week throughout mid-summer). The proportion of women fishermen was higher than in summer; they represented 30% of the fishermen instead of 23.5%.

Number of lines used — More persons fished with two lines in the fall than in the summer. The number of lines used per fisherman was 1.22, showing that about every fifth fisherman used two lines.

Fishermen getting no fish — In the fall season one fisherman in 6 (16.2%) took no fish, while in the summer one fisherman in 4 took no fish. (This indicates that possibly the chances of getting fish were better in the fall than in the summer, or else those who fished during that season were more skillful.) Of a total number of 136 men and 62 women fishing in the fall, 25 men and 7 women were unsuccessful in catching a single fish. Of all fall fishermen 30% were women; while of those getting no fish 22% were women.

Limit catches — No "limit" catches were taken in the fall; however some fishermen almost obtained the limit in perch.

Number of fish taken — The best fishing of the year, in terms of fish per hour, was in October, as a total of 1275 fish were taken at the rate of 2 1/2 fish per hour. In November only 31 fish were taken, at 1.8 fish per hour. The number of fish obtained by the average fisherman for each day (6.7) as well as average size (8.4 inches) was quite good in October.

Analysis of the catch — Bass. Smallmouth bass were of a larger average size in the fall than in the ~~fall~~ summer, but the percentage of the total catch was only about 1/3 as great. The catch per hour was likewise lower in the fall.

The catch per hour of largemouth bass was similar to the summer catch.

The size of these fish remained similar although the percentage of the total catch was materially reduced.

Bluegills and sunfish. Bluegills and sunfish were both slightly larger in size in the fall than in the summer while the "fish per hour" and the percentage of the total catch were decidedly lower.

Rockbass. Rockbass were of about the same average size in the fall as in the summer, though only 1/4 as abundant.

Yellow perch. Perch increased greatly in dominance in the fall fishing. While other species of fish declined in all factors except size, the perch made a very decided increase in everything except size, and even there showed a slight increase. At this season, perch constituted 80% of the total catch, and were taken at the rate of 2 per hour.

Apparently during the summer, the fishing was not directed toward any one species, while in the fall it was directed primarily toward perch fishing. Fall fishing was not so intensive as summer fishing but in the number of fish caught per hour, it was superior to the latter.

Other species. Walleyes, northern pike and bullheads were relatively insignificant in the fall, as few were taken.

Hours fished The total hours fished in October were 519, of which 135 1/2 were in the the morning and 383 1/2 in the afternoon. Only 17 hours of fishing were reported for November. For both October and November, each fisherman fished an average per day of 2.7 hours; approximately the same length of time as in the summer. The fishing was concentrated in the later hours of the morning and mid-afternoon.

Method of fishing Virtually all fishing in the fall season was still-fishing, though several individuals both still-fished and trolled.

Winter fishing

This report includes the winter fishing from December 21, 1933 to April 30, 1934, which was submitted in Institute Report 266, together with the data from December 1-20, 1934. These together represent a full winter's fishing, though it includes

portions of two winter seasons. For convenience some tables for the winter season of 1933-34 are presented again, together with the added figures for the next season.

Number of fishermen — The tables show that (1) 474 fishermen fished Fife Lake during the winter (Table VI);(2) of these 474, 332 speared while 142 line fished (Table VI);(3) January was decidedly the outstanding month for winter fishing (Table VII).

Only 14 of the 474 fishermen were women, their total winter catch consisting of one northern pike.

Method of fishing — Line fishing is analyzed in Table VIII, spearing in Table VII and the two are compared together in Table VI. These tables show that the method of fishing with spears predominated very decidedly (70%), but that linefishing produced the greatest number of fish.

Fishermen getting no fish — The total number of fishermen and the number getting no fish are listed below:

	No. fishing	No. getting no fish
December 21 - 31, 1933	7	3
January, 1934	304	207
February, "	65	56
March, "	54	42
April 1-15, 1934	14	7
December 1-20, 1934	23	12
	467	327

Seventy percent of those fishing during the winter took no fish.

Limit catches — No limit catches were taken in the winter. The best catch taken by one fisherman was 3 northern pike, these fish having an average length of 24 inches.

Fish taken — A total of 286 fish were taken during the entire winter fishing season, 154 by line fishing and 132 by spearing. They were taken at the rate of one fish per 8 hours fishing, and about 1/2 fish per fisherman day.

Table VII . Computations for fishing on Fife Lake, winter of 1933-1934.

Spearing only

1. (Months spearing is permitted)	Jan.	Feb.	Total
2. Hours fished	1112.25	270.5	1382.75
3. No. fishermen	271	61	332
4. Hours per fish	9.26	22.5	10.5
5. Fish per hour	.11	.044	.095
6. Fish per fishermen	.44	.2	.4
7. Av. hrs. per fisherman	4.1	4.4	4.2
8. Fish caught	120	12	132
9. Northern pike			
a. Number of fish	99	4	103
b. % of total catch	82.5	33	78
c. % of total n. pike catch	96	4	100
d. N. pike per hour	.09	.015	.074
10. Walleye			
a. Number of fish	1	...	1
b. % of total catch	.8	...	.2
c. % of total walleye catch	100	...	100
d. Walleyes per hour	trace	...	trace
11. Bullhead			
a. Number of fish	12	5	17
b. % of total catch	10	42	12.9
c. % of total bullhead catch	71	29	100
d. Bullheads per hour	.01	.02	.013
12. Common sucker			
a. Number of fish	8	3	11
b. % of total catch	6.7	25	8.3
c. % of total common sucker catch	73	27	100
d. Suckers per hour	.01	.01	.008

Table VI. Comparison of line fishing and spearing on Fife Lake, winter of 1933-'34 and December 1-20, 1934

Item	Line fishing	Spearing	Total or Average
1. Hours fished	715.5	1382.75	2098.25
2. No. fishermen	142.0	332.0	474.0*
3. Average hours per fisherman	5.0	4.2	4.5
4. Fish caught	154.0	132.0	286.0
5. Fish per hour	.215	.095	.13
6. Hours per fish	4.6	10.4	7.3
7. Fish per fisherman day	1.1	.4	.6
8. Perch	133.0	...	133.0
9. Walleyes	5.0	1.0	6.0
10. Northern pike	13.0	103.0	116.0
11. Bullheads	...	17.0	17.0
12. Common suckers	....	11.0	11.0
13. Shiners	3.0	...	3.0
14. Average size of all fish	11.8	22.8	16.9

* 7 used both lines and spears and were considered separately under each. The actual number of fishermen was 467.

Table VIII. Computations for fishing on Fife Lake, winter of 1933-34.

Line fishing only

	Dec. 21, 1933 to Apr. 15, 1934	Dec. 1-20, 1934	Total
1. Bait used	minnows*	minnows	minnows*
2. Hours fished	601	114.5	715.5
3. No. fishermen	119	23	142
4. Av. hrs. per fisherman	5	5	5
5. No. of lines	423	110	533
6. Av. No. lines per fisherman	3.55	4.8	3.75
7. Line hours	2411.5	547.5	2959
8. Fish taken (legal)	128	26	154
9. Undersized fish taken	7	...	7
10. Hours per fish	4.7	4.4	4.6
11. Fish per hour	.21	.23	.215
12. Line hours per fish	18.8	21.1	19.2
13. Fish per fisherman	1.07	1.1	1.1
14. Perch			
a. number	112	21	133
b. % total catch	87.5	81	86.4
c. Perch per hr.	.19	.18	.19
15. Walleye			
a. number	2	3	5
b. % total catch	1.6	11.5	3.25
c. walleyes per hr.	.003	.026	.007
16. Northern pike			
a. Number	11	2	13
b. % total catch	8.6	7.7	8.4
c. N. pike per hr.	.02	.017	.02
17. Shiners			
a. number	3	...	3

* Minnows were used exclusively as bait, except for one hour with two lines during January when worms were used.

Compared in size with the summer fish the winter ones were much larger ~~in size~~; about 12 inches for those caught on line fishing and 23 inches for those on spearing (17 inches for both).

Table VI shows the number and species of fish taken by both fishing methods. The catch consisted largely of two species, perch and northern pike; the perch being taken by line fishing and the pike by spearing.

Hours fished — Each fisherman fished for an average period of about 5 hours per fishing day. Fishing was during daylight only and was between 9 A.M. and 5 P.M. ~~Fishing was so poor in winter and~~ So few fish were caught that the best time of day for fishing could not be determined with any degree of accuracy. It is possible that the "best fishing curve" in winter may be much more uniform and "flattened" than it is for summer.

Total fishing

Table IX gives figures on total fishing for one year and a comparison of fishing for each season. Figures for the winter are based on total fishing done (100%); figures for the summer on 93% of total fishing and fall figures on 98.5% of total fishing done. The additional figures in parentheses are based on the assumption that those fishermen not contacted (149 individuals), those whose fishing was incorrectly recorded (32) and those for whom sheets were lost (3) were similar to the average figures for the 3064 fishermen contacted. Table IX is discussed below:

1. Hours fished. Fife Lake was fished for a total of 9318 1/2 hours. Assuming that the lake has an area of 800 acres, this represents 11.6 hours of fishing on each ~~lake~~ acre, for the entire year. The table shows that 22.5% of this fishing was in the winter season, 71.6% in summer and 5.9% in the fall. It will be noted that almost 1/4 of the fishing hours were in winter.

2. Number of fishermen. The total number of fishermen for each season was: winter 467, summer 2570, fall 201. Represented in percentages the fishermen for each season were: winter 14.4%, summer 79.4% and fall 6.2%.

About 4/5 of the fishermen fished during the summer season.

Table IX. Total fishing on Fife Lake for one year (Dec. 21, 1933-Dec. 20, 1934).

	Winter	Summer	Fall	Total
1. a. Hours fished	2098.25	6187.75 (488.5)[1]	536 (8)[1]	9318.5[1]
b. % of total	22.5	71.6	5.9	
2. a. No. of fishermen	467	2399 (181)	198 (3)	3248
b. % of total	14.4	79.4	6.2	
3. Hours per fisherman	4.5	2.6	2.7	2.87
4. a. No. of fish	286	10656 (804)	1306 (20)	13072[2]
b. % of total	2.2	87.7	10.1	
5. Fish per fishermen	.6	4.44	6.6	4.0
6. Fish per hr.	.13	1.72	2.43	1.4
7. Av. size of all fish (in.)	16.9	8.33	8.4	8.5
8. Perch[3]				
a. Number	133	3757 (283)	1058 (16)	5247
b. % total catch	46.5	35.24	80	40.1
c. perch per hr.	.06	.61	1.97	.56
d. av. size	9.0	7.4	8.0	7.6
9. Rockbass				
a. Number	...	2129 (160)	71 (1)	2361
b. % total catch	...	20.0	5.4	18.1
c. rockbass per hr.	...	.34	.13	.25
d. av. size	...	7.9	8.0	7.9
10. Bluegills				
a. Number	...	1970 (148)	80 (1)	2199
b. % total catch	...	18.49	6.2	16.8
c. bluegills per hr.	...	.32	.15	.24
d. av. size	...	7.2	7.5	7.2
11. Smallmouth bass				
a. Number	...	992 (74)	50 (1)	1117
b. % total catch	...	9.31	3.8	8.5
c. smallmouth bass per hr.	...	.16	.09	.12
d. av. size	...	12.25	14.4	12.3
12. Sunfish				
a. number	...	1016 (76)	10	1102
b. % total catch	...	9.53	.8	8.4
c. sunfish per hr.	...	.16	.02	.12
d. av. size	...	6.8	7.1	6.8
13. Bullhead				
a. number	17	303 (23)	3	346
b. % total catch	5.9	2.84	...	2.6
c. bullheads per hr.	.008	.05	...	.03
d. av. size	12	10.5	11.3	10.6
14. Largemouth bass				
a. number	...	294 (22)	23	339
b. % total catch	...	2.76	1.8	2.6
c. largemouth bass per hr.	...	.04	.04	.03
d. av. size	...	13.5	13.7	13.5
15. Northern pike				
a. number	116	48 (4)	7	175
b. % total catch	39.9	.45	...	1.3
c. pike per hr.	.05	.01	...	.015
d. av. size	25.4	21.8	21	24.1
16. Walleye				
a. number	6	119 (9)	4	138
17. Sucker				
a. number	11	9 (1)	...	21
18. Calico bass				
a. number	...	15 (1)	...	16
19. Shiners				
a. number	3	4	...	7

[1] Figures in parenthesis are for fishermen seen but not directly contacted; those whose fishing was incorrectly recorded; and those who records were lost. The figures in parenthesis are included in the total and in the percentage figure.

[2] Seventy-four additional fish were recorded, for which the length was lacking. These included smallmouth bass (1), rockbass (16), bluegills (19), sunfish (9), perch (25) and bullheads (4); and were not included in the calculations.

[3] Species taken in order of their abundance.

3. Hours per fisherman. The average number of hours per fisherman in winter (4.5 ~~hours~~) was almost twice that of summer (2.6) and fall (2.7). People fished longest at a season when the weather was the least pleasant. The average fisherman for the entire year fished less than 3 hours per day (2.87 hours).

4. Number of fish. Table IX shows (1) that although approximately 1/4 of the fishing was in winter, only 2.2% of the catch was taken at that season, and (2) that about 87.7% were caught in the summer. The seasonal comparison of fishing must be (and was) based on comparative catches.

5. Fish per fisherman. For the entire year, each fisherman took an average number of 4.0 fish per each fishing day. In the winter, however, each fisherman took less than one (.6) fish per day (in fact, only a little more than half a fish).

6. Fish per hour. The winter fisherman took only .13 fish per hour, the summer fisherman took 1.72 fish per hour, and the fall fisherman took almost 2.43 fish per hour. The average for the year was 1.4 fish per hour. Creel census figures for all non-trout water for Grand Traverse County, for the years 1928-1932 based on the general creel census, (random sampling) averaged .64 fish. If the "random sampling" shows accurately the fishing for the entire county, it may be concluded that fishing on Fife Lake in 1934 was more than twice as good as fishing in the county in general for the years 1928-32.

7. Average size of all fish. The fish taken in winter averaged approximately twice (16.9 inches) the size of those taken in the summer (8.3) and fall (8.4). The fish for the entire year had an average length of 8.5 inches.

8. Yellow perch. As seen in ~~the~~ Table IX, 2 fish out of every 5 caught were perch. Approximately 1/2 (46.5%) of the winter-caught fish were perch; 1/3 (35.2) the summer-caught fish were perch, and 4/5 (80.0) the fall-caught fish were perch. This species was at its lowest ebb at a time when fishing was heaviest, and best at seasons when fishing produced the least revenue for tourists. The average size of the perch was smallest when the summer fishing was the heaviest.

9. Rockbass. This species, as well as the following four, was not taken in winter, and was taken only in small numbers in the fall. One-fifth of all fish taken during the tourist and resort season (summer) ~~were~~ was rockbass. These fish had a fair average size (7.9 in.

10. Bluegills. Bluegills resembled rockbass in total number taken; in the majority being taken in summer; comparatively few in fall and none in winter. Their average size, however, was smaller; 7.2 inches for bluegills as compared to 7.9 inches for rockbass. This species ranked first in number taken during several weeks in mid-summer when fishing was most intensive.

11. Sunfish. The bluegill-sunfish ratio was two to one, both in total number taken and in fish ~~weight~~ caught per hour. The sunfish had the smallest average size of all the food and game fish (6.8).

12. Smallmouth bass. 1117 smallmouth bass were caught. This represents between 1 and 2 fish per acre. One smallmouth bass was taken for each 8 hours of fishing. This species was probably the most important one taken in Fife Lake. It had a fair average size (12.3 inches).

13. Bullheads. Of each 40 fish taken one was a bullhead. Bullheads were caught at all seasons but were best represented numerically in the summer catch.

14. Northern pike. Northern pike constituted 40% of the winter catch and only 1/2 percent (.45) of the summer catch. The average size of the pike was good (24.1 inches), especially in winter (25.4 inches). Scale samples of some of these pike indicated that their growth rate is relatively rapid.

15. Largemouth bass. The largemouth bass were taken at the rate of 1 per 33 hours of fishing. They had an average size of 13.5 inches. The species constituted 2.6% of the total catch.

16. Walleyes. Walleyes, though much prized by the fishermen, were taken in small numbers.

Winter versus summer fishing

Due to the availability of data for each season of the entire year, it is now possible to definitely determine the extent to which winter fishing on Fife Lake might have influenced the summer fishing for 1934. The figures for each season indicate (to those who might feel that winter fishing affected summer fishing in an adverse way) what effect this winter fishing has on summer fishing.

It can be noted that almost 1/4 of the total time spent in fishing was in winter. Much of this

fishing was by spearing, which necessitated the use of a considerable number of fish shanties. Due to the amount of shanties (or the number of fishermen seen in winter) it might easily be concluded that summer fishing must suffer, because of this seemingly heavy winter activity. However, anyone studying the actual winter catch, as given here would hardly come to such a conclusion, for only 2.2% of the entire yearly catch of fish was taken in winter. It is true that the winter-caught fish had a larger average size and that the 2 species which constituted almost the entire winter catch were perch and northern pike.

Perch constituted over a third (35.2%) of the summer catch. The winter catch of 133 perch was only a very small percentage (2.5%) of the total yearly perch catch (5247).

Northern pike were taken primarily in winter. Pike did not bite well in summer, an unfortunate situation as tourists and out-of-state fishermen greatly desire these showy fish. As few pike at present are caught in summer, it may well be desired to have these fish taken in winter, as they decidedly prey upon some of our most desired summer-caught species.

More fish were taken in the best day of summer (280 fish on August 7) than were taken during the entire previous winter fishing season (260).

It must be concluded that winter fishing on Fife Lake for the year considered here was obviously not injurious to fishing during the summer of 1934; in fact it could even be argued that winter fishing may have been helpful to the summer fishing by removal of pike and excess perch.

Data not analyzed

The data for Fife Lake have not yet been fully utilized. Several more useful and and interesting facts could be discovered by further analysis of the creel census sheets, such as:

(1) Effects of weather conditions on numbers of persons fishing and on the daily fish catch.

(2). Distribution of the various size groups for each individual species and for all species. (Only the average size has been determined and discussed in this report).

(3) Number of fish each individual fisherman caught (only average catch, limit catch, and no catch were here considered).

(4) Effectiveness and use of various types of natural and artificial baits (natural bait was mostly used and consisted primarily of minnows and worms).

Further data which could be obtained by added "non-creel" investigations:

(1) The actual yearly number of fish taken from each acre of water (To do this a careful survey of the lake is needed).

(2) Number of pounds of fish per acre for 1934. (Length and weight curves for the several species must be made before production can be based on a wieght basis.)

(3) Growth rate of the several species. (Except from a few pike, scales for growth rate and age of fish were not collected.)

Benefits from continued creel census

If at all possible, the creel census should be continued on this lake for a number of years. Such a census would give (besides information for each year such as that given in this report) certain other information which can be gained only from a study extended over several years. This includes:

1. Fluctuations in total yearly number of fishermen on Fife Lake.

2. Variations in the yearly fish catch, both in total catch and in the catch for each species. The yearly total fish population and the variations in the total number of each species apparently fluctuates more from year to year than has been generally realized. It is becoming obvious that cycles occur in our lakes so that first one species will be dominant and then another; this turn over repeating itself again and again.

3. Variations in yearly growth rate and possible reasons for these variations.

4. Depletion. Should fishing continue to be as good during the next few years as it was during 1934 it can be safely concluded that the 1934 catch was not more than the 1934 "crop" and that the lake was not overfished. If, however, there was a definite decline in the crop, with the same amount of fishing, then it may be assumed that the lake was being overfished. The study would show, to some degree, what "yearly" number can be taken without causing depletion.

The above are only a few of the problems which might be partially solved by a continued census.

Census on other lakes

As so much valuable information has been obtained from the creel census of Fife Lake it is evident that the census should be taken on a considerable number of lakes. Such a census on a number of lakes would give (1) information on fishing production on each lake; (2) a comparison of the production on the several types of lakes; (3) kind of fish best suited for the several waters, and other important problems.

The C.C.C. and creel census

This report indicates clearly that selected C.C.C. men can take creel census well. However, the average C.C.C. man is incapable of making a thorough, accurate check, and for this reason it is absolutely necessary to have picked men, capable of doing such work, in order to have the creel census successful. Constant contacts with a considerable number of camps has indicated clearly that what can be done depends largely on those who are in charge of the men; for if the camp superintendent and his immediate assistants are actively interested in their work, know their men, and assign men to the job who are best fitted for the work, much can be accomplished in a satisfactory manner. For instance, Superintendent Ferris is a technically trained man who knows well his men and the meaning of accuracy and thoroughness. He is likewise interested in this work. Consequently his camp completed its creel census project in a very satisfactory manner.

It is hoped that creel census may be continued on Fife Lake and that it may be initiated or continued on other lakes as well.

INSTITUTE FOR FISHERIES RESEARCH

R W Eschmeyer

R. W. Eschmeyer
In Charge, Lake Improvement Investigation

CREEL CENSUS—Michigan Department of Conservation

County.....Fisherman's Name.....

Township.....City or Town.....

Lake or Stream.....Sex?.....Approximate Age?.....

SPECIES CAUGHT	LEGAL SIZE		UNDERSIZE	
	Number	Av. Lgth.	Number	Av. Lgth.
Brook Trout				
Rainbow Trout				
Brown Trout				
Large Mouth Bass				
Small Mouth Bass				
Bluegills				
Sunfish				
Yellow Perch				
Pike Perch (Walleyes)				
Northern (Grass) Pike				

(Enter other kinds taken on blank spaces above)

Date.....193.....

Kind of Fishing:

Ice?..... Still Fishing?.....

Boat?..... Trolling?.....

Shore?..... Casting?.....

Number of lines?.....

Bait (Check if only one kind of bait used)

How many fish caught with worms?.....

Minnows?.....Spinner?.....

Plug?.....Artificial Fly?.....

If taken with other bait, or by spear, dipnet or other means, state how.....

Weather: Clear?.....Cold?.....

(Check) Cloudy?.....Mild?.....

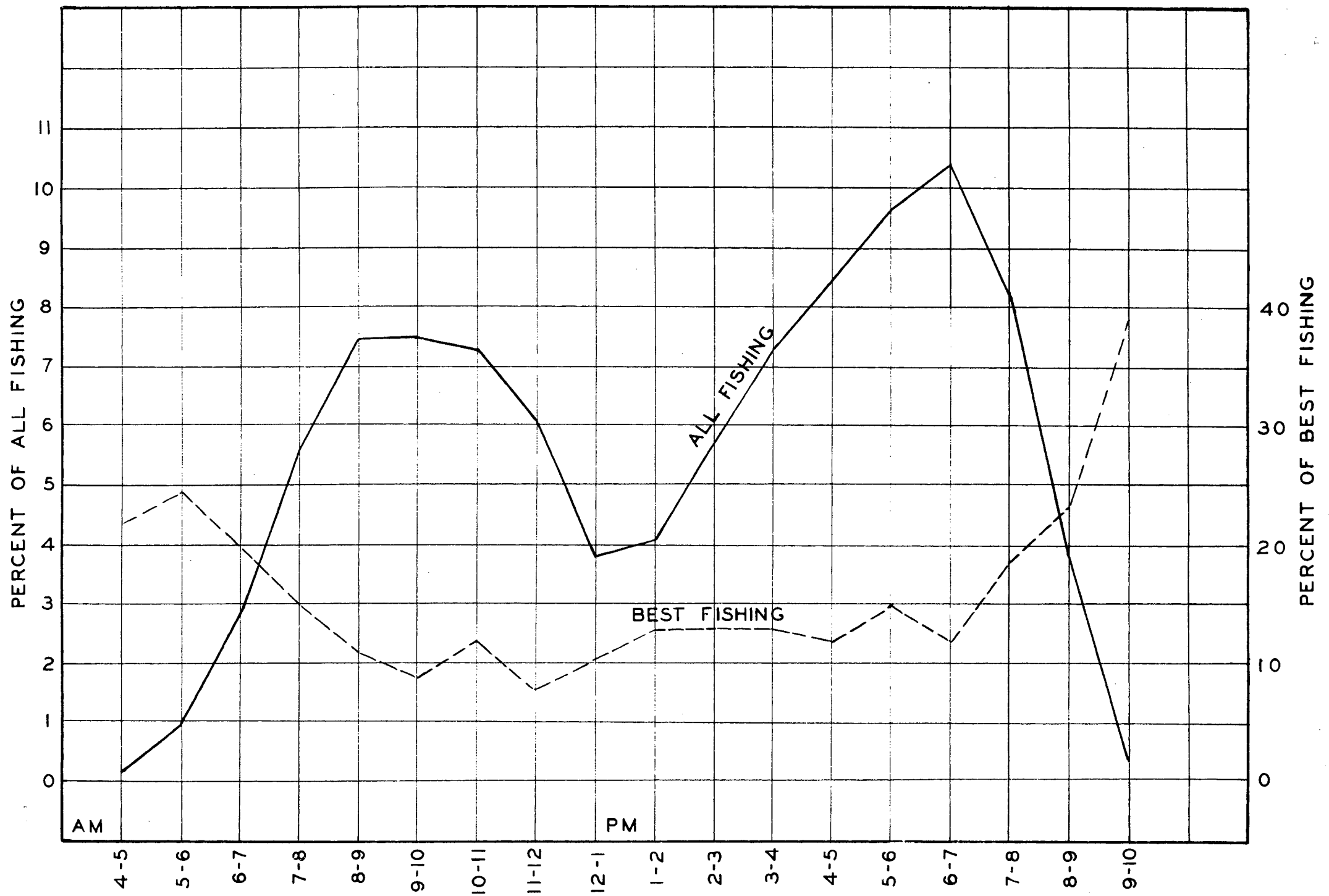
Rain?.....Warm?.....

TIME FISHED _____HRS.

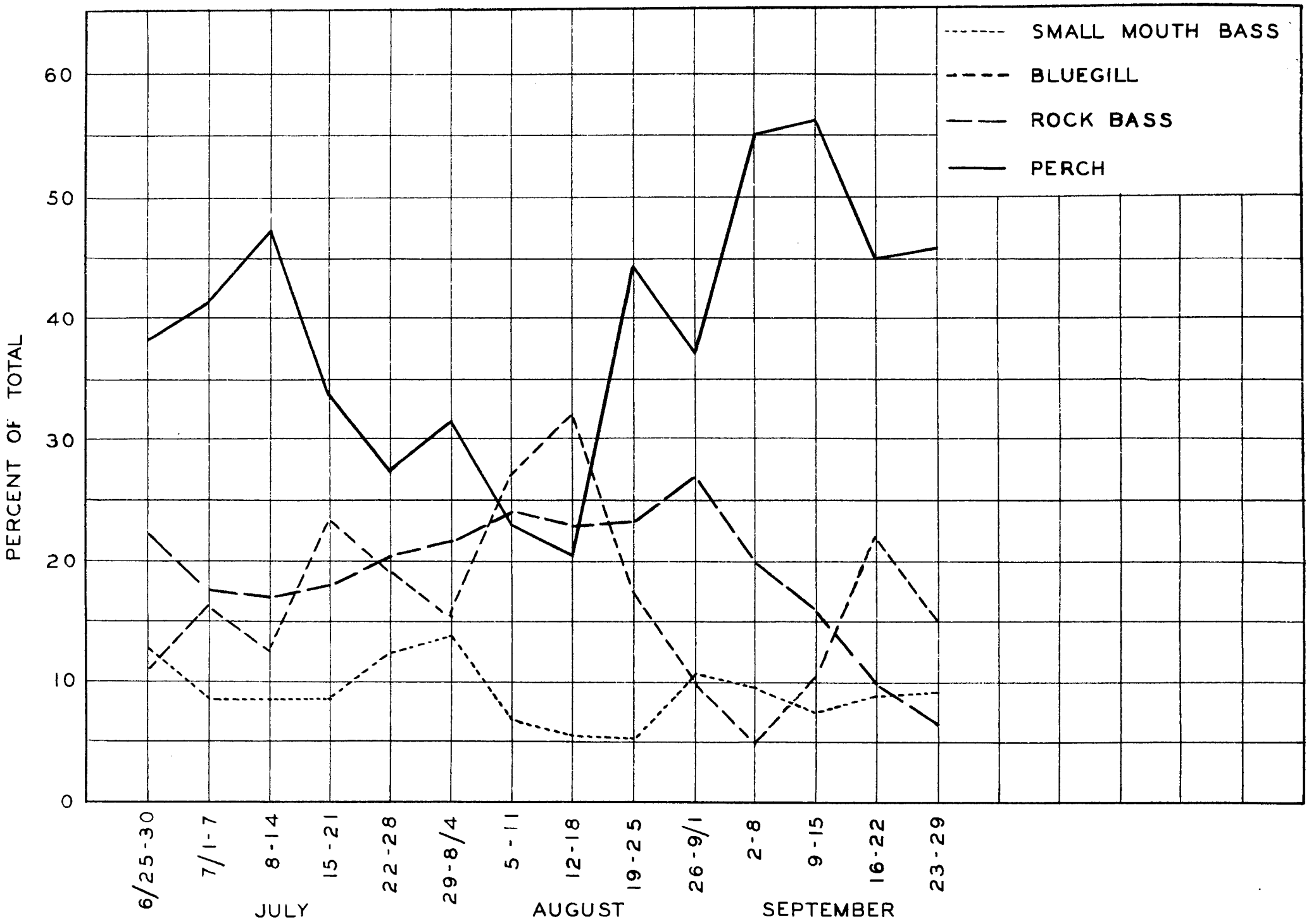
A.M. ➔ 12 1 2 3 4 5 6 7 8 9 10 11 12

P.M. ➔ 12 1 2 3 4 5 6 7 8 9 10 11 12

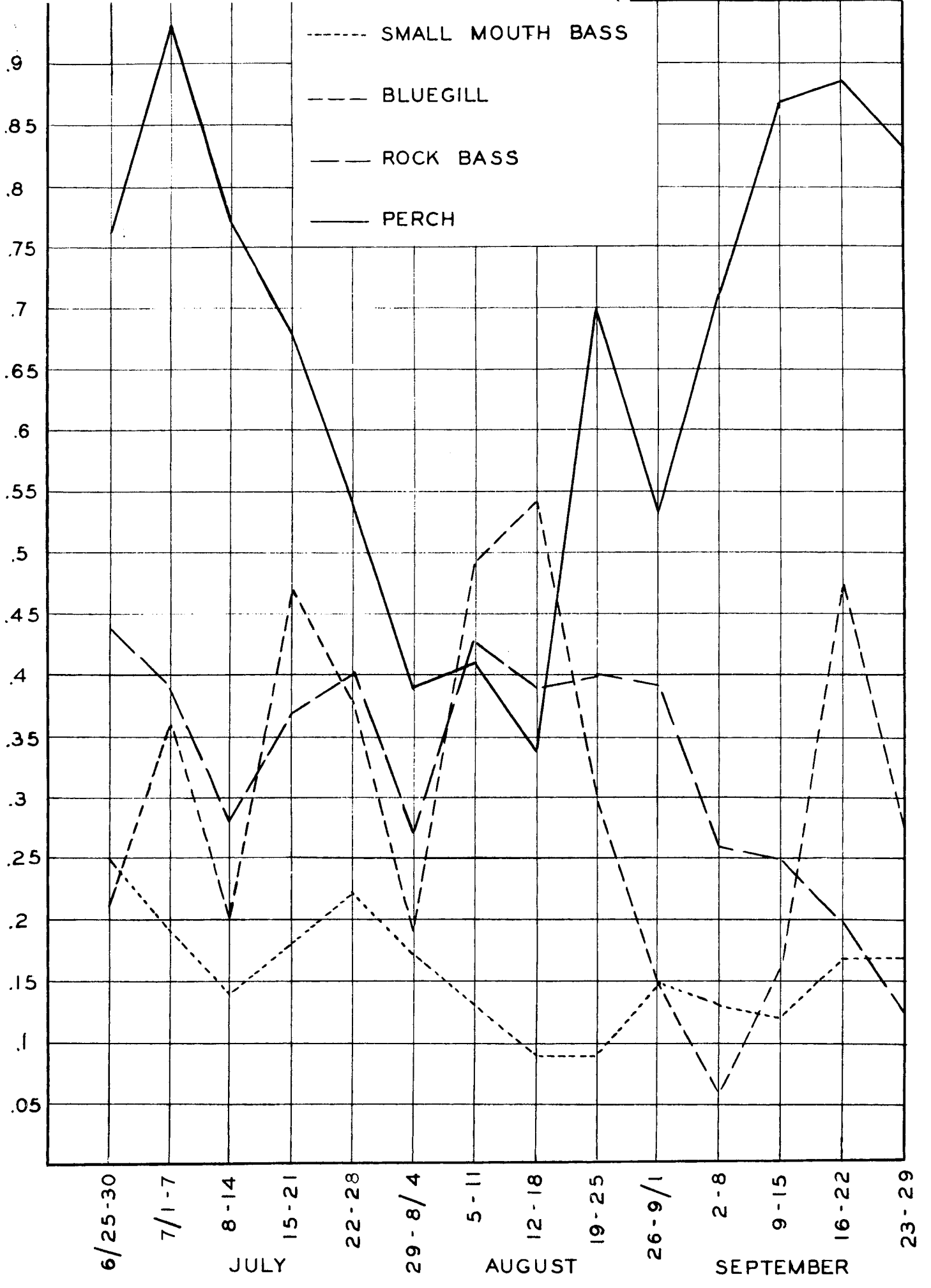
Draw line through hours fished; double line when fishing was best; figure to quarter hours.
Make separate report for every person fishing. Make out report whether fish are caught or not.



GRAPH NO. 1 ALL FISHING AND BEST FISHING FOR EACH HOUR. FIFE LAKE IN SUMMER OF 1934

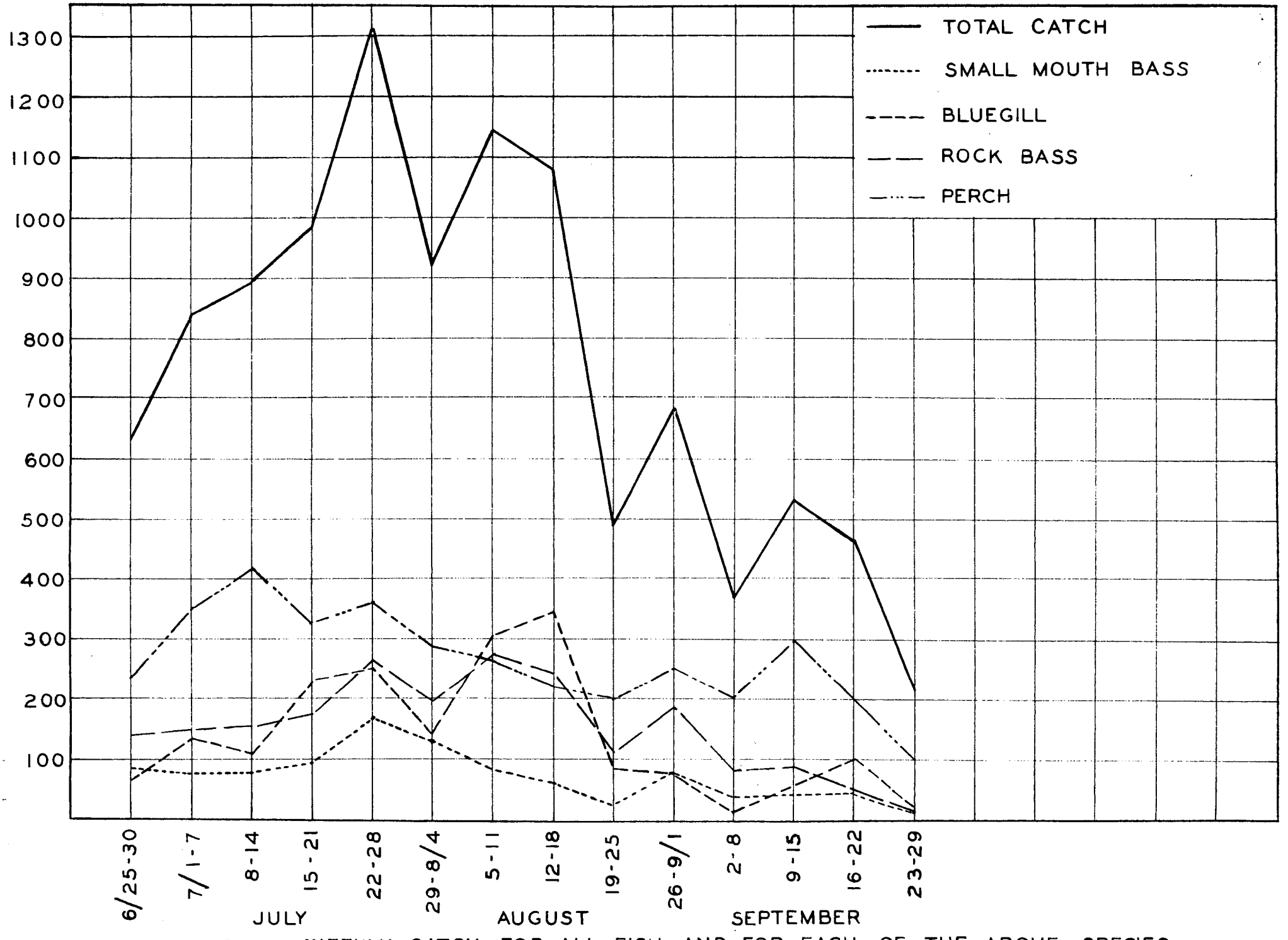


GRAPH NO. 2 PERCENT OF TOTAL CATCH, CALCULATED FOR EACH WEEK. FIFE LAKE SUMMER OF 1934



GRAPH NO. 3 FISH PER HOUR CALCULATED TO THE NEAREST .01 HOUR FOR THE ABOVE SPECIES ON A WEEKLY BASIS

FIFE LAKE SUMMER OF 1934



GRAPH NO. 4 WEEKLY CATCH FOR ALL FISH AND FOR EACH OF THE ABOVE SPECIES.
FIFE LAKE SUMMER OF 1934

Correlate with [illegible] No. 274

ANALYSIS OF THE GAME-FISH CATCH IN A MICHIGAN LAKE

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A paper by G. H. Clark given at the Fisheries meeting in Montreal last year, and the discussion which followed, indicated not only that there is a real need for measuring and interpreting the angler's catch, but also that past attempts in this direction have been unsatisfactory. While that discussion was in progress in Montreal, crews of specially selected C.C.C. men were patrolling the shores of several Michigan lakes, to contact the fishermen as they reached the shore, and to obtain from them full data as to their day's fishing. The aim of the work was to secure as complete a record as possible of all fishing carried on throughout the year in these lakes. This project thus differed from the general Michigan creel census, which since 1927 has been attempting to obtain, by the method of representative sampling only, an appreciation of the trend of fishing throughout the state.

The purpose of this paper is to indicate the method used in taking a complete creel census on a lake, and to show what sort of information, of value or interest to the Department of Conservation and to anglers, can be obtained by such a census. These points are illustrated by the discussion of the census taken on one of the several lakes where this work has been conducted, and is being continued.

FIFE LAKE CREEL CENSUS

Results of the creel census on this lake are available for a full year of fishing (December 21, 1933 to December 20, 1934). This lake is located in the upper part of the Lower Peninsula of Michigan, in Grand Traverse and Kalkaska counties, approximately 20 miles southeast of Traverse City. Since it is on a national highway (U. S. 27), 131 the lake is readily accessible at all times. It has an area of 820 acres within the meander line, reduced by low water at the time of the census to about 800 acres. Fife Lake has a considerable amount of shoal area and a moderate development of vegetation, and appears to be moderately rich in food. If it were possible to select an average Michigan lake, Fife Lake might approach it in most respects.

The creel census was taken by the Fife Lake C.C.C. Camp under the supervision of Superintendent A. L. Ferris and Crew Foreman Erwin Moody. The Camp Superintendent, a technically trained man, was interested in the project, and was sufficiently familiar with his enrollees to place on the census-crew men best suited for the work. Foreman Moody had previously been engaged in fisheries work for the Department of Conservation. This personnel assured the reliability of the data.

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Method of Taking the Census

The men were equipped with special blanks for recording the data and suitable equipment for measuring the fish. In winter they were further equipped with portable headquarters,—a "shanty" which was kept in the vicinity of the most heavily fished area of the lake. In summer and fall the men patrolled the shore, each man being responsible for contacting the fishermen who reached his allotted section of the shore. The data were obtained only when the fishermen had concluded the day's fishing.

The census was taken every day from daylight to dark, except during the closed season in spring (April 30-June 25), when there was obviously no need for taking a census.

Each day the men prepared a list of the number of fishermen seen and the number actually contacted. Since the lake was relatively round and since the crew was of ample size (numbering up to seven men), it is assumed that all of the fishermen were seen. In the fall and winter all those who were seen were also contacted; in the summer 149 records were missed, for anglers seen but not contacted. The 35 blanks that were incompletely filled out or lost were added to these 149 records to give a total of 184 fishermen-days for which full records were not available.

The time of fishing was recorded to the nearest quarter hour; the length of the fish may be considered correct to the nearest half inch.

CREEL CENSUS—Michigan Department of Conservation

County..... Fisherman's Name.....
Township..... City or Town.....
Lake or Stream..... Sex?..... Approximate Age?.....

SPECIES CAUGHT	LEGAL SIZE		UNDERSIZE	
	Number	Av. Lgth.	Number	Av. Lgth.
Brook Trout				
Rainbow Trout				
Brown Trout				
Large Mouth Bass				
Small Mouth Bass				
Bluegills				
Sunfish				
Yellow Perch				
Pike Perch (Walleyes)				
Northern (Grass) Pike				

(Enter other kinds taken on blank spaces above)

Date..... 193...

Kind of Fishing:

Ice?..... Still Fishing?.....
Boat?..... Trolling?.....
Shore?..... Casting?.....
Number of lines?.....

Bait (Check if only one kind of bait used)

How many fish caught with worms?.....
Minnows?..... Spinner?.....
Plug?..... Artificial Fly?.....
If taken with other bait, or by spear, dipnet or other means, state how.....

Weather: (Check) Clear?..... Cold?.....
Cloudy?..... Mild?.....
Rain?..... Warm?.....

TIME FISHED ..... HRS.
A.M. ▼ 12 1 2 3 4 5 6 7 8 9 10 11
P.M. ▲ 12 1 2 3 4 5 6 7 8 9 10 11

Draw line through hours fished; double line when fishing was best; figure to quarter hours.
Make separate report for every person fishing. Make out report whether fish are caught or not.

Fig. 1.—Blank used for recording the creel census data. Actual size 4 x 6 inches. These perforated sheets are made up in books of 100.

Data Obtained

Of the two forms of blanks employed, the one used in the early period of the survey differed from the one shown as Figure 1 primarily in that it lacked the address and approximate age of the fisherman. The form was prepared for use in the general creel census on lakes and streams, as well as for the intensive C.C.C. survey.

The information obtained for each day's fishing includes the name, address, sex, and approximate age of the fisherman; the kind, number, and size of fish caught; the date; the method of fishing; the bait used; the general weather conditions; the hours of the day fished, and the total hours fished; also the time of day when fishing was considered best.

The number, kind, and size of fish were checked by the census-takers and all information was recorded by them. It has been learned that the average angler finds the blank too detailed and too complicated, but that he is quite willing to furnish the desired information.

Summer Fishing

All fishing from the opening date of June 25th to September 30th inclusive has been considered as summer fishing. The extensive information obtained for this period, mostly indicated in detail in the tables and graphs, may be summarized as follows:

Number of fishermen, lines per fisherman, and fishermen taking no fish (see Table 1).—Census returns were obtained for 2,399 fisherman-days, 1,835 for men, 564 for women. A daily average of 24.5 persons fished the lake for the 98 day period; during the height of the fishing season the number of fishermen averaged about 37 daily. Although 2 lines per fishermen are legally permitted, 93 per cent of the reports indicated the use of only 1 line (an example of the sort of fact-finding that should interest legislators).

TABLE 1. NUMBER OF FISHERMEN, LINES PER FISHERMAN, AND FISHERMEN TAKING NO FISH. FIFE LAKE, SUMMER AND FALL OF 1934. EACH FISHERMAN IS LISTED SEPARATELY FOR EACH DAY FISHED

Date	—Number of fishermen— male	female	total	Ave. per day	Ave. lines per person	—Fishermen taking no fish— male	female	total	%
June 25-30	103	18	121	20	1.2	22	4	26	21.5
July 1-7	139	23	162	23	1.05	39	7	46	28.4
July 8-14	168	56	224	32	1.0	59	15	74	33.0
July 15-21	164	25	189	24.1	1.04	47	4	51	27.0
July 22-28	191	50	241	34.4	1.08	29	10	39	16.2
July 29-Aug 4	215	49	264	37.8	1.05	71	8	79	29.9
Aug 5-11	204	54	258	37	1.09	54	6	60	23.2
Aug. 12-18	180	79	259	37	1.09	32	13	45	17.4
Aug. 19-25	82	36	118	17	1.1	22	9	31	26.2
Aug. 26-Sept. 1	136	66	202	29	1.06	40	17	57	28.2
Sept. 2-8	87	30	117	16.7	1.06	26	6	32	27.3
Sept. 9-15	83	34	117	16.7	1.05	16	8	24	20.5
Sept. 16-22	45	24	69	9.9	1.04	5	2	7	10.1
Sept. 23-29	25	17	42	6	1.1	4	3	7	16.7
Sept. 30	13	3	16	16	1.0	0	0	0	0.0
Totals	1,835	564	2,399	24.48	1.07	466	112	578	24.1
October	130	60	190	6.1	1.22	22	6	28	14.7
November	6	2	8	.27	1.25	3	1	4	50.0
Totals for Oct. & Nov.	136	62	198	3.24	1.22	25	7	32	16.2

A total of 578 fishermen, 24.1 per cent of all those fishing (each day's fishing considered separately), caught no legal-sized fish; 466 of these were men, 112 were women. The percentage taking no fish varied from about 10 per cent to 33 per cent. Of all the reports 23.5 per cent were for women; of those indicating no fish caught 19.4 per cent were for women. Proportionately fewer women than men took no fish. There appears to be very little correlation between the number of persons fishing any week and the number catching no fish at that time.

Legal limit catches of bass or pan fish (5 bass, 25 pan fish), or over-limit catches, were indicated in less than 2 per cent of the reports. Only 10 limit catches of pan fish and only 25 limit catches of bass (mostly of smallmouth bass) were made. All limit catches except one were taken on natural bait. No limit catches of five northern pike or of five walleyes were made.

Number of fish, catch per hour, fish per fisherman, and average size of all fish (see Table 2).—The 2,399 fisherman-days yielded a total of 10,656 fish having an average length of 8.33 inches, caught at the rate of 1.72 per hour. The fishermen averaged approximately 4.5 fish each per day's fishing; Fife Lake produced, on the average, more than 100 fish per day for the 98-day period.

The per-hour catch as well as the total numbers of fish taken, varied from week to week. It was poorest for the week when most people fished (July 29th to August 4). Since there was some correlation between the catch per hour and the catch per fisherman, the average fisherman tended to fish for a more or less uniform average time without regard to his luck (also shown by Table 4).

TABLE 2. NUMBER OF FISH, FISH PER HOUR, FISH PER FISHERMAN, AND AVERAGE SIZE OF ALL FISH. FIFE LAKE, SUMMER AND FALL OF 1934

Date	No. of fish taken	Fish per hour	Fish per angler	Average size of fish (in.)
June 25-30	629	2.0	5.2	8.95
July 1-7	847	2.25	5.2	8.7
July 8-14	896	1.66	4.0	8.4
July 15-21	980	2.03	5.2	8.7
July 22-28	1,302	1.95	5.4	8.3
July 29-Aug. 4	918	1.24	3.5	8.4
Aug. 5-11	1,143	1.77	4.5	8.1
Aug. 12-18	1,083	1.7	4.2	7.85
Aug. 19-25	488	1.78	4.1	7.8
Aug. 26-Sept. 1	683	1.44	3.4	8.3
Sept. 2-8	370	1.29	3.2	8.0
Sept. 9-15	535	1.56	4.6	7.9
Sept. 16-22	464	1.9	6.7	8.2
Sept. 23-29	208	1.81	4.5	8.5
Sept. 30	110	2.0	6.9	8.8
Total or Average	10,656	1.72	4.44	8.33
October	1,275	2.46	6.7	8.4
November	31	1.8	3.9	7.7
Total or Average for October and November	1,306	2.43	6.6	8.0

Analysis of the catch by species (see Table 3 and Fig. 2).—The 12 or 13 species taken, were, in the order of abundance in the catch: perch (*Perca flavescens*), rockbass (*Ambloplites rupestris*), bluegill

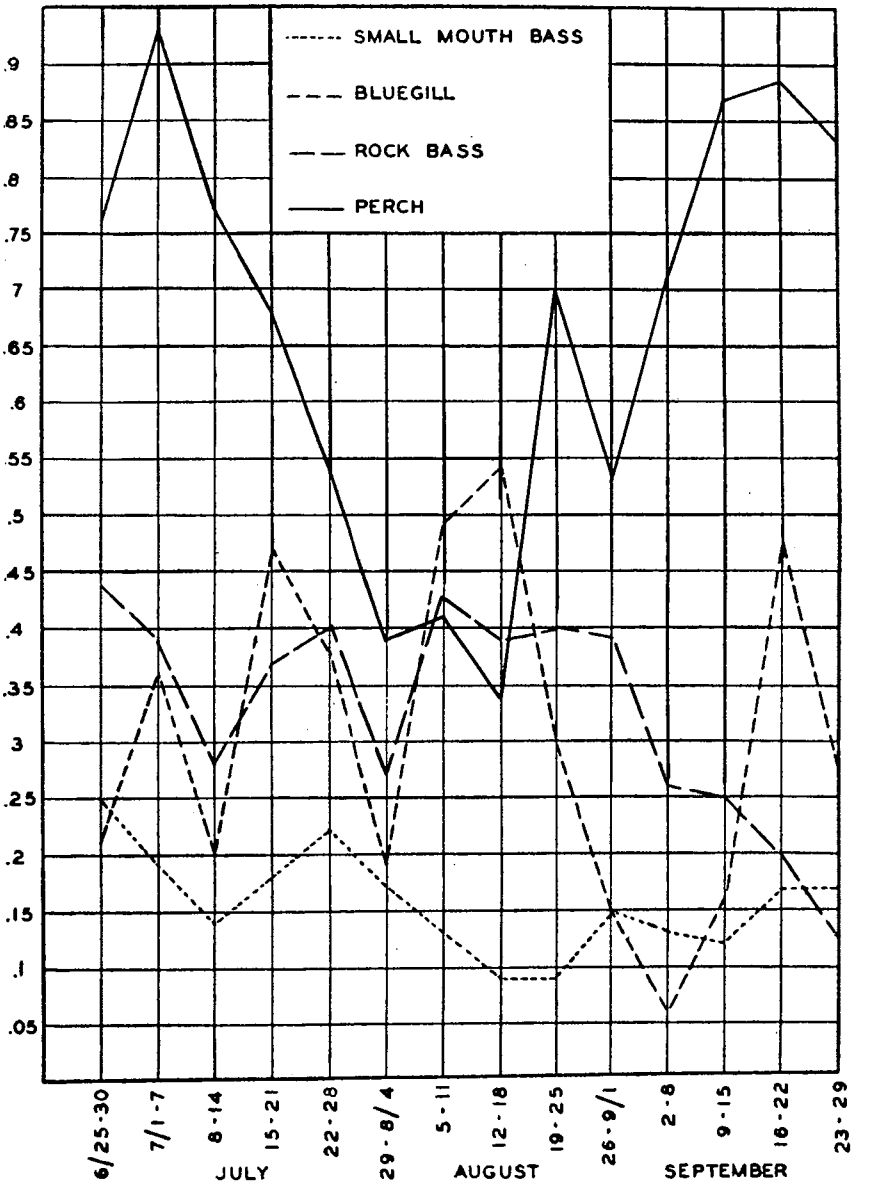

Fig. 2.—Fish per hour calculated to the nearest .01 hour for the species indicated above on a weekly basis. Fife Lake, summer of 1934.

(*Helioperca macrochira*), pumpkinseed (*Eupomotis gibbosus*), smallmouth bass (*Micropterus dolomieu*), bullhead (*Ameiurus nebulosus* and *natalis*), largemouth bass (*Aplites salmoides*), walleyed-pike or pike-perch (*Stizostedion vitreum*), northern pike (*Esox lucius*), black crappie (*Pomoxis sparoides*), sucker (*Catostomus commersonnii*), and shiner (probably *Notemigonus crysoleucas*). The average size for any one species remained relatively constant from week to week as the season progressed. The per-hour catch of each species fluctuated from week to week but the weekly fluctuations in the per-hour catch of any one species was not accompanied by a similar fluctuation in the per-hour catch of the other species. The four largest game fish, largemouth bass, smallmouth bass, northern pike and walleye, represented 12.6 per cent of the entire catch. The catch of smallmouth bass totaled 992 fish, of an average length of 12.25 inches. They represented 9.31 per cent of the total catch and were taken at the rate of 1 fish per 6 hours of all fishing. The per-hour catch was best during the first week of the season, possibly because spawning had recently been completed and the males were feeding heavily. The total large mouth bass catch was 294 fish, of an average length of 13.5 inches. They reppresented 2.76 per cent of the total catch and were taken at the rate of 1 fish per 25 hours of fishing. Smallmouth bass outnumbered the largemouths almost 10 to 3. It therefore appears that the lake might best be classed as a smallmouth bass lake.

The total bluegill catch was 1,970 fish of an average length of about 7.2 inches. The bluegills represented almost one-fifth of the total catch and were taken at the rate of approximately one fish per three hours of fishing. They were biting best in mid-summer and for several weeks during the height of the tourist season they ranked first in the catch. A total of 1,016 pumpkinseeds was taken. These had an average length of less than 7 inches, and represented 9.5 per cent of the total catch. The catch was decidedly inferior to the bluegill catch in number and in catch per hour; and the sunfish averaged somewhat smaller than the bluegills.

A total of 2,129 rock bass with an average length of almost 8 inches was caught. They represented 20 per cent of the total catch and were caught at the rate of 1 fish per 3 hours of fishing. Over a third (35.2 per cent) of the fish caught were perch. They had an average length of about 7.5 inches. The catch, in terms of fish per hour, dropped decidedly during mid-summer (Fig. 2). Most of the few walleyes (pike-perch) caught were taken during the first four weeks; few were taken after mid-July. On the average only one northern pike was taken from the lake every two days. A total of 303 bullheads were taken. They had an average length of 10.5 inches. The catch included 15 black crappies, 9 suckers and 4 shiners.

Total hours fished and average hours fished (see Table 4 and Fig. 3).—The fishermen fished for a total of 6,187.75 hours; 38 per cent of the fishing was in the morning, 62 per cent in the afternoon and eve-

ning. The daily fluctuation between morning and afternoon fishing was pronounced. Weather apparently was the chief factor responsible for this fluctuation. The average fishing day, 2.6 hours, varied relatively little from week to week. Obviously fishing on this lake did not occupy the major portion of the fisherman's time.

There were two daily peaks in fishing intensity (Fig. 3), one from 8:00 to 11:00 A. M., the other late in the afternoon. Over 10 per cent of all fishing was between 6 and 7 P. M. Fishing was best, how-

TABLE 3. ANALYSIS OF THE CATCH. FIFE LAKE, SUMMER AND FALL OF 1934*

	Smallmouth Bass			Largemouth Bass			Bluegill			Sunfish		
Date	No. taken	Ave. size	Per hr.	No. taken	Ave. size	Per hr.	No. taken	Ave. size	Per hr.	No. taken	Ave. size	Per hr.
June 25-30	80	12.3	.25	37	13.2	.12	67	7.1	.21	37	7.1	.12
July 1-7	73	12.0	.19	37	13.5	.10	136	7.2	.36	40	7.2	.11
July 8-14	76	12.2	.14	14	15.3	.03	110	7.0	.20	62	6.7	.11
July 15-21	86	12.1	.18	32	15.1	.07	231	7.5	.47	76	6.9	.16
July 22-28	162	12.1	.24	19	15.1	.03	251	7.2	.38	133	6.8	.20
July 29-Aug. 4	128	12.1	.17	14	14.3	.02	141	7.3	.19	131	7.2	.18
Aug. 5-11	82	12.3	.13	28	12.2	.04	306	7.6	.48	148	6.7	.24
Aug. 12-18	60	12.3	.09	40	12.8	.06	346	7.1	.54	114	6.7	.18
Aug. 19-25	25	11.3	.09	15	11.7	.05	85	7.0	.30	46	6.9	.16
Aug. 26-Sept. 1	72	11.8	.15	21	13.7	.05	70	7.3	.15	74	6.8	.16
Sept. 2-8	36	11.8	.13	6	12.3	.03	18	7.1	.06	23	6.5	.08
Sept. 9-15	40	13.2	.12	9	12.9	.03	55	6.8	.16	24	7.0	.07
Sept. 16-22	41	13.0	.17	12	11.4	.05	103	7.0	.47	48	6.8	.20
Sept. 23-29	19	13.8	.17	7	14.1	.06	31	7.6	.27	28	6.5	.24
Sept. 30	12	14.8	.22	3	14.7	.05	20	6.8	.36	32	6.3	.58
Total or Ave.	992	12.25	.16	294	13.48	.04	1,970	7.22	.32	1,016	6.83	.16
Per day	10.1			3.0			20.1			10.4		
October	49	14.5	.09	23	13.7	.04	79	7.5	.15	8	7.1	.02
November	1	10.0	.06	----	----	----	1	7.0	.06	2	7	.12
Total or Ave.	50	14.4	.09	23	13.7	.04	80	7.5	.15	10	7.1	.02

	Rockbass			Perch			Walleye			Northern Pike		Bullhead	
Date	No. taken	Ave. size	Per hr.	No. taken	Ave. size	Per hr.	No. taken	Ave. size	Per hr.	No. taken	Ave. size	No. taken	Ave. size
June 25-30	140	8.7	.44	239	7.4	.76	14	19.0	.04	2	21.0	9	10.0
July 1-7	148	8.2	.39	349	7.3	.93	26	19.9	.07	3	24.7	35	11.0
July 8-14	152	7.9	.28	418	7.3	.77	28	20.8	.05	6	19.5	30	9.9
July 15-21	178	8.8	.37	330	7.6	.68	19	17.8	.04	3	23.0	25	9.2
July 22-28	267	7.5	.40	358	7.6	.54	3	16.2	----	2	21.5	107	10.5
July 29-Aug. 4	197	7.6	.27	287	7.6	.39	6	23.9	.01	2	18.5	12	11.6
Aug. 5-11	276	7.6	.43	265	7.4	.41	8	21.6	.03	9	19.1	21	10.5
Aug. 12-18	247	7.5	.39	220	7.1	.34	7	18.9	.01	2	18.0	42	11.2
Aug. 19-25	114	8.0	.40	199	7.2	.70	2	23.0	.01	----	------	1	12.0
Aug. 26-Sept. 1	184	8.1	.39	253	7.5	.53	2	24.5	----	2	23.5	5	9.6
Sept. 2-8	74	7.9	.26	204	7.5	.71	1	28.0	----	6	24.5	2	11.5
Sept. 9-15	87	7.6	.25	299	7.1	.87	1	18.0	----	4	18.7	9	10.5
Sept. 16-22	47	7.6	.20	207	7.7	.88	1	25.0	----	3	27.3	1	10.0
Sept. 23-29	14	7.8	.13	95	7.9	.83	1	18.0	.01	----	------	3	12.0
Sept. 30	4	7.0	.07	34	7.8	.61	----	----	----	4	26.0	1	12.0
Total or Ave.	2,129	7.9	.34	3,757	7.4	.61	119	20.1	.02	48	21.8	303	10.5
Per day	21.7			38.33			1.2			.49		3.1	
October	68	8.0	.13	1,035	8.0	1.99	4	20.0	.01	6	22.2	3	11.3
November	3	8.0	.18	23	7.4	1.35	----	----	----	1	14.0	----	----
Total or Ave.	71	8.0	.13	1,058	8.0	1.97	4	20.0	.01	7	21.0	3	11.3

*Black crappies, suckers, and shiners were also caught, but were taken in such small numbers that they constituted an insignificant portion of the total catch.

TABLE 4. TOTAL HOURS FISHED AND AVERAGE HOURS FISHED, FIFE LAKE, SUMMER AND FALL OF 1934

Date	Total hours fished	Hours fished, A.M.	Hours fished, P.M.	Time not given	Hours per fisherman-day
June 25-30	316.5	88.5	228	.....	2.6
July 1-7	376.0	213.0	161.5	1.5	2.25
July 8-14	539.5	184.0	353.5	2.0	2.4
July 15-21	484.0	224.0	260.0	.....	2.6
July 22-28	665.5	300.75	360.75	4.0	2.8
July 29-Aug. 4	739.25	279.0	455.75	4.5	2.8
Aug. 5-11	644.5	207.0	437.5	.....	2.5
Aug. 12-18	628.0	233.0	396.0	.....	2.4
Aug. 19-25	284.25	112.25	170.0	2.0	2.4
Aug. 26-Sept. 1	474.75	179.5	291.75	3.5	2.35
Sept. 2-8	286.75	90.0	196.75	.....	2.45
Sept. 9-15	342.0	66.5	275.5	.....	2.9
Sept. 16-22	235.0	104.0	131.0	.....	3.4
Sept. 23-29	115.25	53.75	61.5	.....	2.7
Sept. 30	55.5	18.5	37.0	.....	3.5
Totals or averages	6,187.75	2,353.75	3,816.5	17.5	2.6
October	519.0	135.5	383.5	.....	2.7
November	17.0	3.5	13.5	.....	2.1
Totals or averages for Oct. and Nov.	536.0	139.0	397.0	.....	2.7

ever, about daybreak and about dusk. Relatively few persons fished at the time of day when fishing was best (this is a sample of the information of value to anglers).

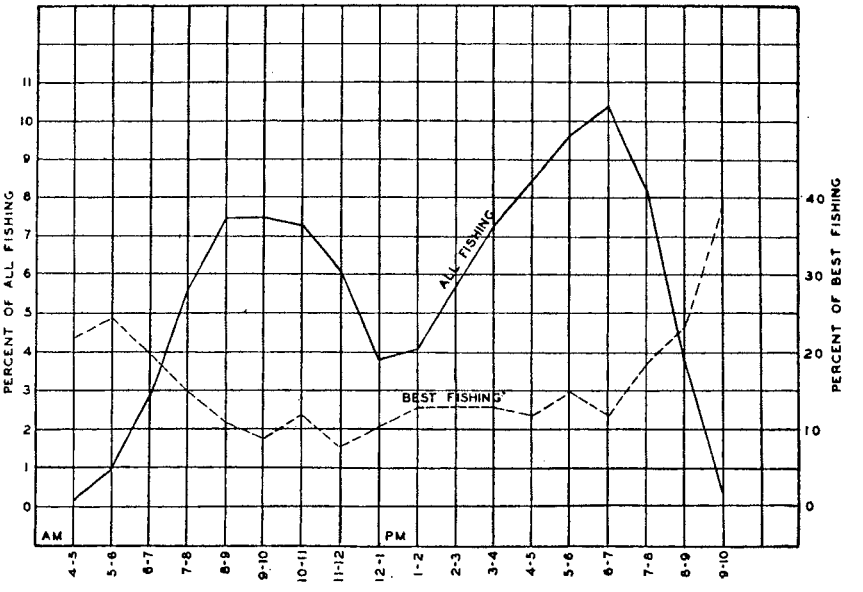

Fig. 3.—Hours when fishing was done, and hours when fishing was best. Fife Lake, summer of 1934.

Methods of fishing and kinds of bait used (see Tables 5, 6 and 7, and Figs. 4, 5 and 6.—More than 90 per cent of the records indicated one method of fishing, either still-fishing, casting, or trolling; 87 per

Table 5. General data on methods of fishing, Fife Lake, summer of 1934

Method	Reports covering each method* No.	%	Fish taken by each method	Fish per day's fishing	Ave. length of fish (in.)	Reports indicating no fish caught No.	%
Trolling	221	10	193	.87	14.1	102	46.0
Casting	66	3	58	.88	12.5	28	42.4
Still-fishing	1,919	87	9,504	4.95	8.2	380	19.8

*This computation does not include the 189 records indicating the use of several methods of fishing in one day or not indicating which method was used. These 189 reports gave a total catch of 901 fish, 4.8 fish averaging 8.7 inches long per fishing day. It therefore appears that most of these reports refer to still fishing.

cent of the fishing by a single method was done by one method, still-fishing, which yielded a daily average per person of about 5 fish averaging 8.2 inches long. About one-fifth of the reports on still-fishing showed no catch. The 10 per cent of the fishing which was by trolling produced on the average less than 1 fish per fishing day; almost half of the trolling days yielded no fish at all, but the fish that were caught averaged 14.1 inches in length. Only 3 per cent of the fishing was by casting, and resulted in an average catch of less than one fish, averaging 12.5 inches long, per fishing day; 42.4 per cent of the reports for casting indicated no fish caught. Obviously the method which produced most fish per fisherman yielded fish averaging the smallest. This was not unexpected, a method which produces numerous large fish would soon be used almost universally.

Table 6. General data on effectiveness of various kinds of bait used, Fife Lake, summer of 1934

Bait used	No. of records	% getting no fish	Hrs. per fishing day	No. of fish taken	Fish per hour	Ave. size of all fish (in.)
ARTIFICIAL:						
Spinner	102	33	2.3	197	0.9	12.5
Plug	75	39	2.4	86	0.5	14.5
Artificial fly	10	50	2.1	23	2.3	8.2
NATURAL:						
Minnows	857	17	2.7	4,336	1.9	8.4
Worms	832	17	2.5	3,936	1.9	7.8
Grasshoppers	27	33	3.1	140	1.7	9.3

Six kinds of bait were listed, three artificial (spinner, plug, and artificial fly), and three natural (minnows, worms, and grasshoppers). Spinners, indicated as used exclusively by 102 reports, produced per hour, on the average, almost one fish; the fish so caught had an average length of 12.5 inches; a third of the spinner-fishing records showed no catch. Plugs, used exclusively on 75 fishing days, yielded only one-half fish per hour, but these averaged 14.5 inches; more than one-third of the fishing records for plugs listed no fish at all. Artificial flies were used so little, that the figures available have little significance.

Minnows, used exclusively on 857 fishing days, produced per hour 1.9 fish, having an average length of 8.4 inches. Worms were almost identical with minnows in effectiveness, except that they produced fish of a slightly smaller average size (7.8 inches). Grasshoppers, used very little as bait, were almost as effective as worms or minnows and produced fish of a large average size. As expected, the number of fish taken per hour by different types of bait was inversely proportional to the average size of fish taken, and the larger the average size of fish taken, the less was the chance of getting any fish at all.

TABLE 7. ANALYSIS OF CATCH (BY SPECIES) ON VARIOUS KINDS OF BAIT. FIFE LAKE, SUMMER OF 1934

	All species	Largemouth bass	Smallmouth bass	Rock bass	Bluegills	Sunfish	Perch	Walleyes	Northern pike	Bullheads
ARTIFICIAL BAIT										
Spinner:										
Number caught	197	41	44	35	20	10	12	27	8	----
Average size	12.5	13.4	13.1	9.0	7.6	7.7	9.8	19.1	20.1	----
Catch per hr.	.09	.18	.19	.15	.09	.04	.05	.12	.03	----
Plug:										
Number caught	86	20	22	6	2	----	14	18	4	----
Average size	14.5	15.2	13.3	8.3	10.0	----	7.8	21.7	20.0	----
Catch per hr.	.05	.11	.12	.03	.01	----	.08	.10	.02	----
Artificial Fly:										
Number caught	23	----	2	2	12	1	4	----	----	----
Average size	8.2	----	11.0	8.0	8.6	7.0	7.5	----	----	----
Catch per hr.	2.3	----	.10	.10	.57	.05	.19	----	----	----
NATURAL BAIT										
Minnows:										
Number caught	4,336	110	459	724	603	336	1,943	18	22	101
Average size	8.4	13.0	12.5	7.9	7.4	6.8	7.6	19.7	23.0	9.7
Catch per hr.	1.9	.05	.20	.31	.26	.14	.84	.01	.01	.04
Worms:										
Number caught	3,936	47	234	901	926	572	1,106	5	6	137
Average size	7.8	12.2	11.8	8.0	7.1	6.9	7.2	20.8	18.8	11.4
Catch per hr.	1.9	.02	.11	.44	.45	.28	.54	trace	trace	.07
Grasshoppers:										
Number caught	140	11	14	48	53	----	14	----	----	----
Average size	9.3	16.9	11.6	8.8	7.7	----	8.4	----	----	----
Catch per hr.	1.7	.13	.17	.58	.64	----	.17	----	----	----

Largemouth bass were most successfully taken on artificial bait; on the average, spinners yielded most largemouths per unit time, plugs took the largest (results on grasshoppers and artificial flies are not considered in this statement or in subsequent remarks). Smallmouth bass were taken with almost equal success on natural and artificial bait, although artificial bait took fish of a larger average size. Largemouth and smallmouth bass showed a decided difference in their response to the several kinds of bait (see Fig. 4). Perch were mostly taken on minnows; walleyes responded chiefly to artificial bait; northern pike were taken also most frequently on artificial bait, but the largest ones, on the average, were caught on minnows (Fig. 5). Rockbass,

bluegills and sunfish were most successfully fished for with worms as bait (Fig. 6).

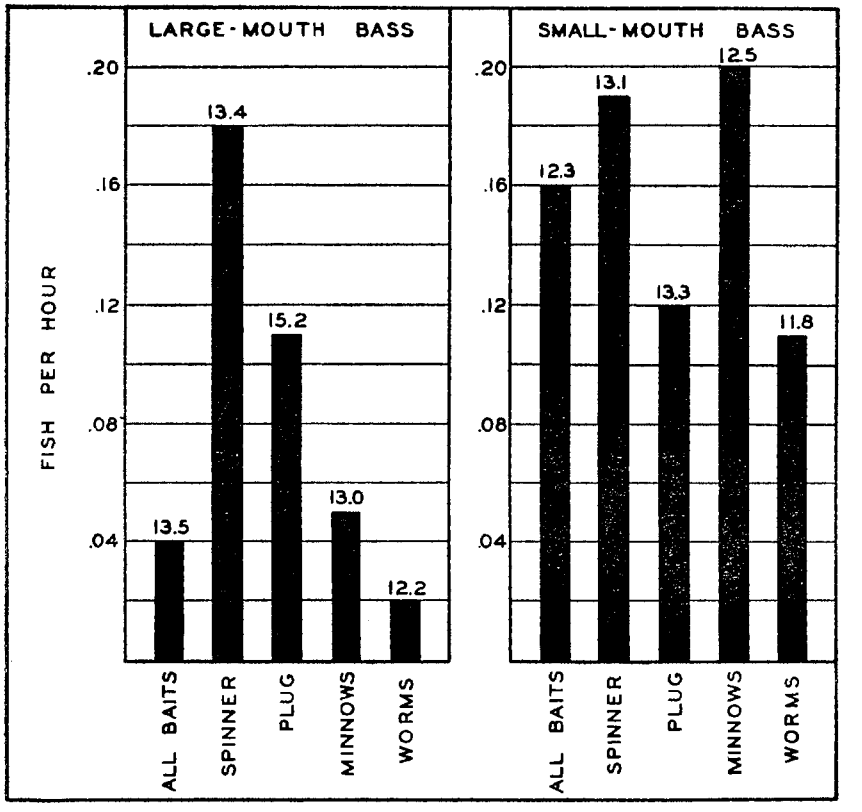

Fig. 4.—Catch, in terms of fish per hour, of large-mouth bass and small-mouth bass on all baits and on each of four different kinds of bait. Summer of 1934, Fife Lake. Figures at the top of each column show the average size, in inches, of fish caught.

Relation between fishing and weather (chart omitted).—Such creel census may also be used to test the relationship between fishing and weather, and this was done for the Fife Lake census. For each day of July and August, the per-hour catch data for all fish and for each of 5 species were plotted on a chart. Barometric pressure for each day, prevailing wind direction, temperature at 6:00 P. M. and median daily temperature, condition of sky (whether clear, partly cloudy, or cloudy), and precipitation, were then plotted on the same graph. A preliminary examination of this chart fails to indicate a close relationship between fishing and any one of the several meteorological factors

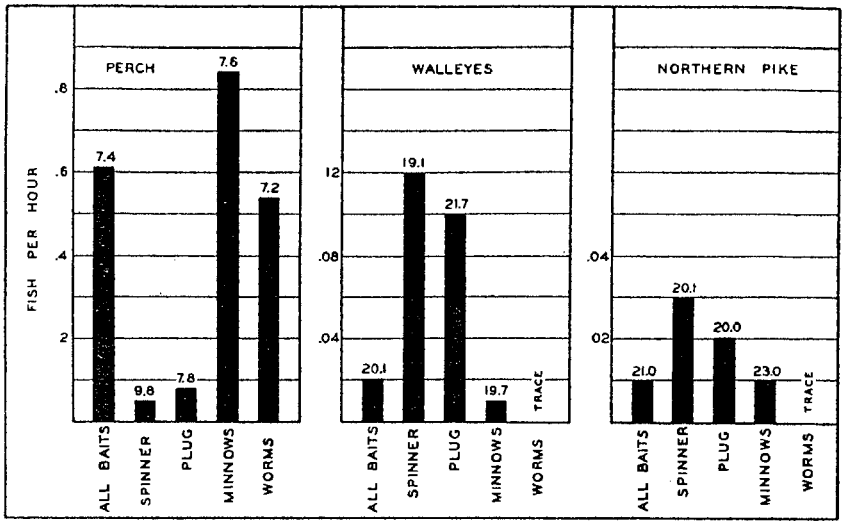

Fig. 5.—Catch, in terms of fish per hour, of perch, walleyes, and northern pike on all baits and on each of four different kinds of bait. Fife Lake, summer of 1934. Figures at the top of each column show the average size, in inches, of fish caught.

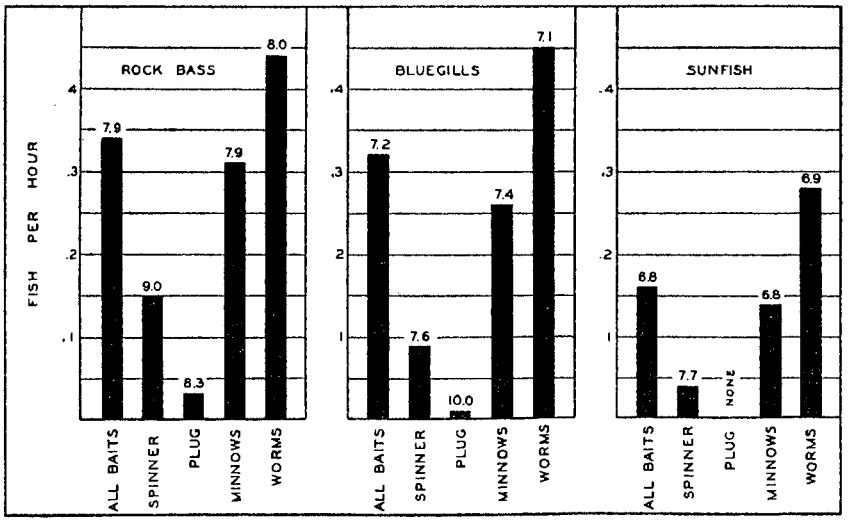

Fig. 6.—Catch, in terms of fish per hour, of rock bass, bluegills, and sunfish on all baits and on each of four different kinds of bait. Fife Lake, summer of 1934. Figures at the top of each column show the average size in inches of fish caught.

which were considered, and therefore apparently fails to lend any considerable support for any one of these theories, although it does not alone and conclusively disprove these supposed relations.

Relation between fishing by residents and visitors.—Although the Fife Lake creel census of 1934 did not involve the necessary data, such a census can be used to compare the fishing by local and visiting anglers. Such comparisons, now being made on census for Fife and other lakes, will provide data bearing on the frequent local controversies between these two groups of fishermen.

Fall Fishing

Fall fishing, which is here considered as restricted to the months of October and November, and data for which are included in some of the preceding tables for summer fishing, are shown by the creel census to be characterized by the following features, among others. Less fishing was done in Fife Lake during the entire fall than in almost any one week in mid-summer; only 190 fishing days in October and 8 in November were listed. Fewer fishing days yielded no fish at all in the fall than in the summer, but as in the summer, fewer women than men, proportionally, had complete failures. No limit catches were made in the fall, but on a fish per hour basis, fall fishing was much better than summer fishing. Perch, constituting 80 per cent of the total fall catch, were then taken at the average rate of two fish per hour. Fall fishing was all still-fishing, with the exception of a very few hours of trolling, and was concentrated in the late morning and the early and mid-afternoon, probably because of warmer air temperature at those hours.

Winter Fishing (Table 8)

TABLE 8. COMPARISON OF LINE FISHING AND SPEARING ON FIFE LAKE, DEC. 21 TO APR. 4, 1933-1934, AND DEC. 1-20, 1934

	Line Fishing	Spearing	Total or Average
Hours fished	715.5	1,382.75	2,098.25
Number of fishermen	142	332	474*
Average hours per fisherman-day	5.0	4.2	4.5
Fish caught	154	132	286
Fish per hour	.215	.095	.13
Hours per fish	4.6	10.4	7.3
Fish per fisherman-day	1.1	.4	.6
Perch	133	-----	133
Walleyes	5	1	6
Northern pike	13	103	116
Bullheads	-----	17	17
Common suckers	-----	11	11
Shiners	3	-----	3
Average size of all fish	11.8	22.8	16.9

*7 used both lines and spears and were considered separately under each. The actual number of fisherman-days was 467.

The winter records, taken for the fishing from December 21, 1933, to April 1, 1934, and December 1 to 20, 1934, thus covering one full winter period though taken in two winters, yielded a number of important conclusions regarding fishing at that season. Winter fishing consisted chiefly of spearing, only one-third of line-fishing. The total winter fishing covered 2,098.25 hours, on 474 fishing days, an average

of 4.5 hours per day. The 142 line-fishing days yielded 154 fish, while the 332 spear-fishing days produced only 132 fish. Fish were taken at the rate of about 1 every 5 hours with lines and 1 every 10 hours with spear. Each day of line fishing yielded an average of one fish; each day of spearing an average of less than half a fish. Seventy per cent of all the winter reports showed no fish caught. The spearing chiefly produced northern pike, while line fishing mostly yielded perch. The average length of all fish caught with lines was 11.8 inches, with spear 22.8 inches, while the average length for all winter-caught fish was about 17 inches. There were no limit catches. All fishing was between 9:00 A. M. and 5:00 P. M. The catch was so meager that a "best fishing" curve could not be made. Only 14 of the winter reports were for women, who caught a total of one fish, a northern pike.

Comparison of the Fishing in Different Seasons (Table 9, first 3 columns).—Of the total of 9,318.5 fisherman-hours in Fife Lake for the year, ending December 20, 1934, 22.5 per cent was in winter, 71.6 per cent in the summer, and 5.9 per cent in fall. The records show 467 fisherman-days in the winter (14.4 per cent), 2,570 in the summer (79.4 per cent), and 201 in the fall (6.2 per cent). The average number of hours per fisherman-day was 4.5 for the winter, almost twice as many as in summer (2.6) or fall (2.7): people fished longest at a season when the weather was the least pleasant and when there was the least probability of catching fish. Of the total of 13,072 fish caught (not including 74 fish for which the lengths were not given), 2.2 per cent were taken in winter, 87.7 per cent in summer and 10.1 per cent in the fall. Almost a fourth of the fishing was in winter but only a little more than one-fiftieth of the fish were caught during that season. The average catch per person per day was 0.6 in the winter, 4.4 in the summer and 6.6 in the fall; the average catch per hour was 0.13 in the winter, 1.72 in the summer and 2.43 in the fall. The fish caught, in the winter, however averaged approximately twice as long as those taken in the other seasons.

Perch, which constituted two out of every five of the fish taken, were caught most commonly in the fall, very seldom in the winter; rockbass were mostly taken in the summer, and bluegills were decidedly summer-caught fish. No comparison of the winter and summer fishing for smallmouth and largemouth bass was obtained, because the season is closed for these species in the winter. Northern pike were mostly caught in the winter. Fishing for both pike and perch was poor during the heat of summer.

Winter fishing was extensive in terms of hours fished. Shanties on the ice and men fishing with four or five ice lines each are conspicuous. It is not to be wondered at that many resorters feel that the winter fishing is responsible for poor summer fishing. When the actual catch records are taken into consideration, however, it is obvious that the winter fishing in Fife Lake could not have been injurious to fishing during the following summer.

TABLE 9. COMPARISON OF FISHING IN DIFFERENT SEASONS AND FOR THE WHOLE YEAR (DEC. 21, 1933-DEC. 20, 1934)

	Winter Dec. 1-Apr. 4	Summer June 25-Sept. 30	Fall Oct. and Nov.	Entire Year	Per Acre
Hours fished	2,098.25	6,187.75 (+488.5)[1]	536 (+8)[1]	9,318.5[1]	11.65
% of total	22.5	71.6	5.9	———	———
No. of fisherman-days	467	2,399 (+181)	198 (+3)	3,248	4.06
% of total	14.4	79.4	6.2	———	———
Hours per fisherman-day	4.5	2.6	2.7	2.9	———
No. of fish	286	10,656 (+804)	1,306 (+20)	13,072[2]	16.33
% of total	2.2	87.7	10.1	———	———
Fish per fisherman-day	.6	4.4	6.6	4.0	———
Fish per hr.	.13	1.72	2.43	1.4	———
Ave. size of all fish (in.)	16.9	8.33	8.4	8.5	———
PERCH[3]					
Number	133	3,755 (+283)	1,058 (+16)	5,247	6.55
% total catch	46.5	35.24	80	40.1	———
Perch per hour	.06	.61	1.97	.56	———
Average size	9.0	7.4	8.0	7.6	———
ROCK BASS					
Number	———	2,129 (+160)	71 (+1)	2,361	2.95
% total catch	———	20.0	5.4	18.1	———
Rock bass per hour	———	.34	.13	.25	———
Average size	———	7.9	8.0	7.9	———
BLUEGILL					
Number	———	1,970 (+148)	80 (+1)	2,199	2.75
% total catch	———	18.49	6.2	16.8	———
Bluegills per hour	———	.32	.15	.24	———
Average size	———	7.2	7.5	7.2	———
SMALLMOUTH BASS					
Number	———	992 (+74)	50 (+1)	1,117	1.40
% total catch	———	9.31	3.8	8.5	———
Smallmouth bass per hour	———	.16	.09	.12	———
Average size	———	12.25	14.4	12.3	———
SUNFISH					
Number	———	1,016 (+76)	10	1,102	1.38
% total catch	———	9.53	.8	8.4	———
Sunfish per hour	———	.16	.02	.12	———
Average size	———	6.8	7.1	6.8	———
BULLHEAD					
Number	17	303 (+23)	3	346	0.43
% total catch	5.9	2.84	———	2.6	———
Bullheads per hour	.008	.05	———	.03	———
Average size	12	10.5	11.3	10.6	———
LARGEMOUTH BASS					
Number	———	294 (+22)	23	339	0.42
% total catch	———	2.76	1.8	2.6	———
Largemouth bass per hour	———	.04	.04	.03	———
Average size	———	13.5	13.7	13.5	———
NORTHERN PIKE					
Number	116	48 (+4)	7	175	0.22
% total catch	39.9	.45	———	1.3	———
Pike per hour	.05	.01	———	.015	———
Average size	25.4	21.8	21	24.1	———
WALLEYE					
Number	6	119 (+9)	4	138	0.17
SUCKER					
Number	11	9 (+1)	———	21	0.03
BLACK CRAPPIE					
Number	———	15 (+1)	———	16	0.02
SHINER					
Number	3	4	———	7	0.01

[1] The figures in parenthesis, for fishermen seen but not directly contacted, for those whose fishing was incorrectly recorded and for those whose records were lost, were used in the total catch and in the percentage computations, on the assumption that these fishermen made average catches.

[2] Seventy-four additional fish were recorded, for which the length was lacking. These included smallmouth bass (1), rock bass (16), bluegills (19), sunfish (9), perch (25) and bullheads (4); and were not included in the calculations.

[3] Species taken in order of their abundance in the catch.

The annual fish crop (see Table 9, last 2 columns).—The creel census being reported upon gives us perhaps the most reliable data on the fishing intensity and on the annual fish crop, available for any public lake in America devoted to sport fishing. On this 800-acre average Michigan lake, a total of more than 9,300 hours of fishing were spent in one year, an average of 11.65 per acre (since most of the lake area was of unsuitable depth, the fishing intensity on the actual fishing grounds was of course much greater). The fisherman days numbered 3,248 (about 4 per acre). This fishing yielded more than 13,000 fish averaging 8.5 inches,—1.75 miles of fish laid end to end. The average yield of fish per hour was 1.4, or 4.0 per fishing day averaging 2.9 hours. Perch (5,247 taken) constituted about 40 per cent of the annual harvest, rock bass 18 per cent, bluegills 17 per cent, smallmouth bass and sunfish about 8.5 per cent each, bullheads and largemouth bass 2.6 per cent, northern pike 1.3 per cent, walleyes 1.1 per cent; suckers, black crappies and shiners in insignificant proportion. The fish crop of this lake is therefore a diversified one. The yield per acre was 6.55 for perch, and proportionately less for the other species taken. The total yield of all fish was 16.3 per acre, perhaps about 10 pounds per acre, considering the entire area of the lake (the poundage per acre will be computed after the length-weight relation has been established for the various species caught).

Creel Census as an Aid in Fish Management

It is obvious that the information determined by such a creel census is potentially of great value in fish management. An adequate inventory will surely be required before fish management can be placed on a business-like basis. A few of the ways by which fish management of inland lakes could be benefited by a thorough creel census are:

1. Determinations of the trend of the fishing returns for the various species caught, determined over a period of years, will indicate what need be done to maintain or increase the fish crop, and the maximum annual crop which may be harvested without injury to the future fishing.
2. The determination of the number of undersized fish taken, coupled with the growth rate studies, will allow predictions to be made of the catch which may be expected for the following few years.
3. The creel census can be used to determine the effectiveness of existing legal restrictions and, in over-fished waters, would help to indicate what restrictions will be of greatest benefit to the lake and the least objectionable to the fisherman. It is entirely possible that the present size limits and bag limits on some species are definitely injurious to the fishing as a whole.
4. A creel census coupled with fish-marking would indicate the number of adult fish in the lake, and the percentage of adult fish removed annually.

5. Coupled with planting and tagging experiments, the census could provide data sufficient to evaluate the benefits derived from stocking.

6. Coupled with lake improvement, the census could similarly be made to indicate, in time, what benefits if any are derived from the improvement work in general, and from improvement devices of different sorts.

7. If carried out on a representative number of lakes of various types and sizes, and if the area of the lakes of a state is determined, the creel census could be used to indicate the approximate annual catch of game fish for the state. If acreage determinations for Michigan lakes are correct, and if Fife Lake fishing was exactly average, the inland lakes of Michigan produced in 1934 a total of 13,500,000 legal-sized fish. If the fish taken from all the lakes averaged the same as for Fife Lake, they have a total length of 1800 miles, approximately equal to the air line distance from southwestern Michigan to Los Angeles, California. Obviously this estimate of total production can not be determined with any reasonable accuracy from the census on one lake, but is mentioned to indicate the sort of inventory of the total game fish catch of the inland lakes in the state which could be made with considerable accuracy provided the creel census was materially expanded.

8. The investigations of the Institute for Fisheries Research lead us to believe that a reasonably sound stocking policy for inland lakes, including a stocking budget, could be formulated by a combination of an extensive creel census with an inventory and classification of the lakes and with biological studies, especially with the determination of the growth rates of the different species in various lakes.