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Research

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DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
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UNIVERSITY MUSEUMS ANNEX
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Report No. 1275

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PRELIMINARY RESULTS OF EXPERIMENTAL

FISHING REGULATIONS ON TWELVE

MICHIGAN LAKES

By

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and

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ABSTRACT

A five-year experiment on the liberalization of fishing regulations on twelve Michigan lakes has been completed. The liberalizations which were tested involve angling for warm-water game fishes. On six lakes the closed season on bluegills and sunfish was removed, allowing anglers to take these species from spawning beds. On two of these lakes additional liberalization took the form of a removal of both the size limit on panfish and the creel limit on bluegills and sunfish under six inches in length. On the other six lakes the regulation prohibiting fishing in the spring for perch, crappies, rock bass and other species not protected by a closed season was removed. This liberalization applied also to the first six lakes.

The changes in fishing quality which might have occurred due to these changes in regulations should have shown up in two or three years. The fishing quality was checked by an intensive creel census. The lake productivity is also being checked by netting, population studies, and age and growth studies.

The census clerks, working each lake on an average of two to three days per week, contacted anglers a total of 56,730 times over the five years. The total angling was estimated at 681,810 fishing trips involving 2,323,865 hours of angling during which 2,116,128 "legal-sized" fish were taken. These figures show an overall catch of 0.91 fish per hour of angling.

The purpose of this experiment was to test the effect of liberalization on fishing quality. Throughout the five years the overall catch per hour for the twelve lakes remained very constant, 1946--0.84, 1947--1.06, 1948--0.87, 1949--0.88, and 1950--0.86. This uniform catch per hour was maintained even though 18 percent of the total boat-angling (spring, summer, and fall) occurred during the added spring season. On the six lakes where anglers could take bluegills and sunfish in the spring, 37 percent of the fishing was done in the (added) spring season, while the catch per hour remained quite constant over the five years.

The lakes open to the taking of an unlimited number of bluegills and sunfish under six inches have not declined in fishing quality even though on Saddle Lake the "sub-legal" catch made up 55 percent of the entire catch; on Bear the catch of undersize fish amounted to 27 percent.

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A five-year experiment in relaxing fishing regulations on twelve Michigan lakes has just been completed. This is a preliminary summary of the principal results of the experiment including a brief statement of methods. A more detailed report of the field methods and personnel, of methods of laboratory analysis of the data, and of the results, is planned for the near future.

This study has been concerned with fishing regulations affecting principally warm-water game species in lakes, i.e., panfish, pike, bass, etc. The general pattern of state-wide fishing regulations for such fish, for some fifteen years or so prior to 1946, has included the following:

1. A state-wide closing of all lakes to fishing from about March 1 to June 25.
2. Closed seasons on fishing for individual game species including January 1 to June 25 for bass, March 1 to June 25 for bluegills and sunfish, and March 16 to May 14 for pike and walleyes.

3. Creel limits on most species, including fifteen on bluegills.

4. Size limits on most species, including six inches for panfish, ten inches for bass, and fourteen inches for pike and walleyes.

From this pattern of fishing regulations, there has been recently some general trend towards liberalization by the legislature. Lakes lying to the north of Highway M-46, starting in 1946, were opened to year-round fishing for all species, exclusive of the closed seasons set on the different species individually, meaning that these lakes were open to year-round fishing for perch, crappies, rock bass and some other species, while the usual closed seasons were in effect on bass, sunfish, pike and walleyes as stated under item 2 above. Effective September 23, 1949, the six-inch size limit on bluegills, sunfish, perch, rock bass and crappies was eliminated. Such changes have reflected the general point of view of fisheries personnel in the state, as determined from the results of research and especially creel censuses, which is that our lakes generally are not being over-fished especially for the smaller, predatory species such as crappies and perch and for non-predatory forms such as the bluegill, sunfish and rock bass. Most circumstantial evidence indicates that these particular fishes do not need protection on their spawning grounds. Size limits are of little necessity to insure an adequate breeding population for at least two reasons: where small fish are frequently caught and kept it is because the species is unduly abundant and probably stunted; and generally these particular fishes are so prolific because of high fecundity and a short life cycle that over-population is a more frequent problem than is scarcity.

The belief that most lakes could be fished more heavily than at present, resulting in a larger total harvest without causing a decrease in angling quality, is also the basis for the present study of experimental regulations.

Three groups totaling twelve lakes have had three sets of special fishing regulations in effect for five years, 1946 to 1950. One group (I) contained four lakes on which the spring closed season on bluegills and sunfish was dropped. The purpose was to determine whether exposure of bluegills and sunfish on their spawning grounds to angling would so interfere with their reproduction as to cause a scarcity of these species in later years. Because of their life cycle, the effect would be noticeable in the catch after two or three years, and in the abundance of naturally spawned young after the first year. Group II included two lakes on which the size limit on panfish was dropped, the spring closed season on bluegills and sunfish was dropped, and the creel limit on bluegills and sunfish of lengths less than six inches was made unlimited. In addition to supplementing the experiment of lakes in Group I, the purpose here was to determine the extent to which small panfish would be removed by anglers and the extent to which such removal might be accompanied by an increase in rate of growth of fish remaining. The question of whether or not the removal of under-size panfish would result in an inadequate number of survivors to spawning adults, as a highly remote possibility, would also be settled. Lakes in Group III, all lying south of Highway M-46, were open to year-round fishing for those species which are not individually protected by statutory closed seasons. This allowed year-round fishing for perch, crappies and rock bass, somewhat longer fishing seasons on pike and walleyes, but no change in the season on bass, bluegills and sunfish. The question here is whether or not this added fishing can be allowed without detracting from the quality of fishing during the important summer season and without harming the quality of fishing for bass, bluegills and sunfish. Even though no additional fishing is allowed for the latter species, they might be adversely affected during the process of being caught and released, or by a disruption of their spawning.

The lakes in the three experimental groups, as referred to above, together with their acreages are as follows:

<u>Name</u>	<u>County</u>	<u>Acreage</u>
<u>Group I</u>		
Big Portage	Jackson	360
Fife	Grand Traverse	575
Minnewaukon	St. Joseph	126
Sugarloaf	Washtenaw	180
<u>Group II</u>		
Bear	Hillsdale	117
Saddle	Van Buren	271
<u>Group III</u>		
Craig	Branch	122
Duck	Calhoun	629
Fine	Barry	320
Lobdell	Genesee	545
Pontiac	Oakland	585
Whitmore	Livingston	677

At the time these special regulations were put into effect, local sportsmen's groups and individuals were advised as to the nature of the experiments and were consulted on public opinion. All the lakes are subject to moderately heavy or very heavy fishing. All of them have boat liveries or some type of public access. The lakes were posted as to the nature of regulations.

The study of these lakes has consisted of an intensive creel census, supplemented by periodic netting collections of fish samples, population estimates by netting on two lakes, and age and growth studies. In this report, we are principally concerned with the creel census results. Only a general description of the creel census procedure is given here; while a more detailed account is planned for a later report.

On Sugarloaf, Big Portage, Minnewaukon, Fife, Bear and Saddle lakes, during the first year (1946), one or more full-time census clerks were

assigned to each lake for a full coverage of fishing. The clerks attempted to contact all fishermen at the end of their fishing day or to contact a large number of them and make a direct estimate of the number of fishermen which they missed each day. This procedure gave a daily total of the number of fishermen on the lake. After the first year, the procedure was modified to the practice of making counts every two hours of the number of fishing boats on the lake. The average number of boats multiplied by the average number of fishermen per boat, the length of the fishing day, and the number of days per season, gave an estimate of the total number of angler hours on the lake per season.

On the remaining six lakes, starting with the first year, the census clerks followed a randomized system of periodic boat counts every third day on a given lake, from which total fishermen hours were calculated.

On all twelve lakes during the five-year period, the clerks contacted a large portion of all anglers at the completion of fishing trips to record the time spent fishing and the number and kinds of fish caught, from which the average number of fishermen per boat, the average length of the fisherman day, and the average catch per hour per angler have been computed. Multiplying the total fishing intensity by the catch per hour per angler was the method used to give total catch per season for each lake.

The procedure, described above, of calculating total fishing statistics from boat counts and from census-interviews with a portion of all anglers is summarized by the following formulae:

Average boat count = average number of fishing boats on the lake, in counts every two hours, two or three days per week, for the particular season (spring, summer or fall) for each lake.

Length of fishing day = length of day during which fishing was usually done, corresponding to daylight hours and to time when boat counts were made, varying from 12 to 14 hours during the year, averaged per season.

Days per season = number of days in particular season; April 1 to June 24 for spring, June 25 to September 15 for summer, and September 16 to November 1 for fall (the limits of spring and fall varying somewhat from year to year).

Anglers per boat = number of anglers in boats contacted at the completion of fishing trips, average for each season.

Hours per angler = the number of hours each angler spent fishing, averaged for all anglers contacted for each season.

Catch per hour per angler = the average catch of all "legal-size" fish, or of all "legal-size" plus "sub-legals" collectively, per hour for each angler, averaged for all anglers contacted for each season.

- (A). Total estimated angling hours per season = Average boat count X Length of fishing day X Days per season X Anglers per boat
- (B). Total estimated angler trips = Total angling hours per season ÷ Hours per angler
- (C). Total estimated catch of fish = Total angling hours per season X Catch per hour per angler

The figures on catch per hour per angler are rounded off to tenths in the accompanying table, but were computed to four decimal places for the calculations of Formula (C). Yearly catch-per-hour values given in Table 2 were derived by dividing yearly catch by yearly totals of angling hours, whereas the seasonal values are catch per hour per angler. Species composition of the catch is based on the numbers of each species in all creels of fishermen contacted by census clerks, totaled for each year. Yearly totals of angler trips, angling hours, and catch are derived by summation of seasonal estimates.

The estimated totals on angler trips, angler hours, number of fish caught, catch per hour per angler, and species composition of the catch, by season, year and lake, are summarized in accompanying tables. Data on winter fishing are not included in this preliminary report; their inclusion (later) will not materially change the conclusions given below. A study of these tables will give a rather clear concept of the effect of the special fishing regulations on fishing in these lakes. There is no point in citing any great number of figures from these tables; a few of the summary figures will suffice.

The total number of anglers at the completion of fishing trips actually contacted by creel census clerks during spring, summer and fall of the five years (1946-1950) was 56,730.

The percentage distribution of different species of fish in these creels, summarized by year for each lake, is given in Table 1. Two sets of figures are given for each year on Bear and Saddle lakes and for 1949 and 1950 on the other lakes. One set ("legal" fish) includes legal-size bass, pike, etc., plus panfish over 6 inches in length. The other set of figures ("all") includes the fish in the "legal" category plus panfish under 6 inches long. Undersize panfish were legal on Bear and Saddle during the experiment and on all lakes beginning September 23, 1949.

The bluegill in most lakes makes up the major part of the catch. The perch, pumpkinseed, black crappie and largemouth bass are major contributors. The rock bass and bullheads are important in a few lakes. The pike is a consistent contributor but low in numbers. Smallmouth bass and walleyes are minor in importance.

The accompanying Table 2, which is a summary of statistics of fishing on the twelve lakes, contains subtotals for lakes in Groups I and II (combined) and Group III. For example, for Groups I and II combined, the estimated total number of fishing trips (angler-trips) on all six lakes in 1946 was 35,370, in 1947 it was 42,520, in 1950 it was 40,430 and the five-year total was 193,300; the five-year total for all twelve lakes was 681,810 fishing trips. For the twelve lakes the five-year estimated total catch was 2,116,128 "legal-size" fish in 2,323,865 angler-hours of fishing at an average catch per hour of 0.91 fish. We are interested in the trend of total fishing intensity over the five years, for the six lakes as a group in which spring fishing for bluegills was allowed, in the other six lakes as a group, and

in all twelve as a group; the totals on fishing trips are excerpted from Table 2 for easy comparison:

	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
Groups I and II	35,370	42,520	35,090	39,890	40,430
Group III	85,970	118,240	119,290	103,650	61,360
All	121,340	160,760	154,380	143,540	101,790

The fishing intensity remained constant over the five years on Groups I and II combined. This is especially noteworthy because the catch per hour (from Table 2) also remained quite constant (with a slight improvement) over the period:

	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
Groups I and II	0.82	0.90	0.73	1.03	0.95

Thus it is concluded that the spring fishing for bluegills and sunfish during the spawning season did not cause a decline in fishing quality or in total amount of fishing and total catch.

For the six lakes of Group III, which were open to year-round fishing for species in their respective open seasons, the above totals show a marked change in fishing intensity over the five years, with 1947 and 1948 as "high" years followed by some decline in 1949 and a big decline in 1950. This "cycle" in the six-lake totals reflects striking cycles in the separate totals for Lobdell, Pontiac and Whitmore lakes (closest to the largest cities) but for Craig, Duck and Fine lakes, individually, the cycle is barely evident. For the six lakes collectively there was a corresponding variation in average catch per hour:

	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
Group III	0.85	1.12	0.91	0.84	0.81

which seems to be more readily explained as not resulting from an effect of the experimental regulations. That is, if the extra fishing allowed on these lakes caused the decline in fishing quality, then 1946 should have been a good year

as compared to 1949 and 1950 whereas there was little difference. Possibly the regulations were partly responsible for the decline. The yearly catch-per-hour figures for all angling on the twelve lakes combined:

	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
Groups I, II, III	0.84	1.06	0.87	0.88	0.86

are remarkably constant. There is no apparent explanation for the higher value for 1947.

The rather striking cycle in total angling on the twelve lakes collectively is not immediately explainable. One possibility is that it reflects the degree of interest of fishermen generally in the experiment modified by the effectiveness of Departmental publicity--taking a year for fishermen to develop maximum interest, with a waning of interest after the third year. Or, the proper explanation may involve the economy and employment status of anglers, and this seems credible because the cycle involved mostly Pontiac, Whitmore and Lobdell lakes which are close to large industrial centers.

The additional amount of fishing allowed by the experimental regulations was the amount done in the spring when the lakes otherwise would have been closed to fishing, plus fishing for undersize panfish in two of the lakes. On the six lakes of Groups I and II, spring fishing for the five years amounted to 52,260 angler-trips, while summer plus fall fishing amounted to 141,040 trips. The spring fishing may be presumed to have added 37 percent to the number of usual angling trips, but total hours were increased by only 30 percent. Spring fishermen fish a shorter time per trip than do summer fishermen. The spring catch was also 30 percent of the total removed during the year, exclusive of ice fishing; i.e., spring fishing was just "average" for the year in these lakes.

For the six lakes of Group III the figures are 50,680 and 437,830, respectively, and 12 percent was added by the spring season.

For all twelve lakes, spring fishing was 102,940, summer plus fall was 578,870, and the amount added by spring fishing was 18 percent.

What was accomplished by the provision that anglers could keep an unlimited number of panfish under six inches on two lakes? On Bear Lake 14,725 undersize fish were legally kept by anglers in five years, as compared to 39,940 legal-size fish; averaging 25 and 68, respectively, per acre per year. Keeping the 25 undersize fish per acre did not cause a decline in subsequent fishing. On Saddle Lake a much larger number (177,230) of undersize bluegills, etc., were kept, as compared to 143,090 legal-size fish, or 131 and 106, respectively, per acre per year. This removal on Saddle did not cause any decline in subsequent catch of legal-size bluegills; the effect, if any, of this removal on average growth of bluegills will be treated in a later report.

After removal of the size limit (six inches) on panfish in all lakes in the fall of 1949 (a separate record of panfish under six inches was then kept in the census), the twelve lakes in 1950 gave 291,635 "legal-size" fish and 113,738 panfish under six inches; thus, dropping the size limit added 39 percent to the catch, numerically. The value of these extra fish for table use was, of course, much less because of their small size.

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Table 1.
SPECIES COMPOSITION OF THE CATCH BY PERCENTAGE OF THE TOTAL CATCH
ON TWELVE EXPERIMENTAL REGULATION LAKES
1946-1950 Ice Free Seasons

Lake	Year	Size fish	Bluegills	Yellow perch	Pumpkinseed	Black crappie	Rock bass	Largemouth bass	Smallmouth bass	Walleye	Northern pike	Bullhead	Warmouth bass	(a) Miscellaneous	Estimated total fish
Big Portage Lake															
	1946		80.7	5.5	2.7	2.4	1.7	4.9	0.2	0.6	1.0	0.1		0.2	8,350
	1947		73.3	10.8	4.2	2.9	2.4	5.0		0.1	0.7		0.3	0.1	8,700
	1948		63.4	12.9	3.6	12.0	1.7	4.1		0.1	1.9		0.4		10,080
W	1949	legal	63.9	7.4	7.6	3.0	3.9	10.8			1.8	0.5	0.5	0.7	5,000
		all	67.2	7.6	8.2	2.7	3.5	9.7			1.6	0.4	0.4	0.6	(b)
W	1950	legal	74.5	5.0	4.7	0.1	2.1	6.6		0.3	0.7	1.0	0.8	3.7	10,689
			76.0	6.8	7.2	0.1	1.6	4.1		0.2	0.4	0.6	0.5	2.3	17,020
Fife Lake															
	1946		32.5	8.7	9.4	14.7	19.0	2.4	1.5	1.6	10.2				18,620
	1947		37.7	14.6	18.8	9.6	13.2	1.2	1.6	0.6	2.3	0.05			25,800
	1948		55.3	4.9	10.2	10.5	11.2	1.8	2.0	0.4	3.8				23,500
W	1949	legal	48.8	14.3	8.7	10.7	11.5	0.6	2.2	0.2	2.9				33,740
		all	No "sub-legal" fish were recorded												
W	1950	legal	47.7	11.6	13.9	15.9	5.4	1.1	1.0	0.2	3.1	0.1			31,010
		all	49.4	10.5	16.7	11.3	8.1	0.8	0.7	0.2	2.2	0.1			43,520
Minnewaukon Lake															
	1946		50.1	3.8	4.1	0.6	0.01	1.7			0.1	32.6		7.0	20,400
	1947		58.9	9.7	8.9	1.3		2.5	0.02		0.1	18.5			19,900
	1948		57.2	9.0	11.0	0.9		2.0				19.9		0.04	18,900
W	1949	legal	54.5	10.9	5.2	4.9		3.7			0.3	20.5	0.05		21,900
		all	54.6	10.8	5.1	4.9		3.7			0.3	20.5	0.05		(b)
W	1950	legal	49.3	9.5	8.2	7.1		2.4	0.10		0.10	22.9		0.30	17,190
		all	58.8	5.7	16.4	4.2		1.4	0.06		0.06	13.2		0.20	25,770

W When size limit was removed on pan fish we started keeping record of number of fish less than six inches removed from lakes.

W No spring census was taken on Big Portage Lake, figures are for summer and fall.

(a) Miscellaneous = dogfish, long-eared sunfish, bluegill x pumpkinseed, garpike, green sunfish, channel catfish (Minnewaukon Lake), carp and golden shiner.

(b) Number of panfish under six inches was insignificant since records were kept only since September 23, when size limit was removed.

Table 1 (cont'd.)
 SPECIES COMPOSITION OF THE CATCH BY PERCENTAGE OF THE TOTAL CATCH
 ON TWELVE EXPERIMENTAL REGULATION LAKES
 1946-1950 Ice Free Seasons

Lake	Year	Size fish	Bluegill	Yellow perch	Pumpkinseed	Black crappie	Rock bass	Largemouth bass	Smallmouth bass	Walleye	Northern pike	Bullhead	Warmouth bass	(a) Miscellaneous	Estimated total fish
Sugarloaf Lake															
	1946		55.9	22.8	4.5	4.3	5.4	2.5			1.7	1.2	0.4	1.3	12,300
	1947		51.8	22.8	11.7	2.4	5.6	2.7			0.4	1.1	1.0	0.5	11,600
	1948		53.0	27.6	6.0	5.2	2.1	3.1			0.9	0.9	0.6	0.7	9,550
✓	1949	legal	48.8	35.5	7.7	0.9	2.1	2.9			0.5	0.6	0.4	0.6	26,400
		all	48.0	36.8	7.5	0.8	2.1	2.8			0.5	0.6	0.4	0.5	(b)
✓	1950	legal	47.6	30.6	6.0	0.4	3.5	6.4			0.2	1.1	1.9	1.6	23,020
		all	48.3	30.9	8.2	0.4	3.1	5.2			0.2	0.9	1.5	1.3	27,040
Bear Lake															
	1946	legal	50.5	34.0	2.2	1.1	2.9	4.4				3.4	0.6	0.9	8,090
		all	53.5	28.5	7.7	0.8	2.5	3.2				2.5	0.4	0.9	11,090
	1947	legal	66.8	9.9	6.0	1.3	2.6	10.5				1.1	1.1	1.0	7,410
		all	69.8	8.1	9.3	0.9	2.3	7.2				0.7	0.7	0.7	10,620
	1948	legal	80.2	7.6	2.2	0.1	0.7	6.6				1.1	1.0	0.6	8,280
		all	82.2	6.8	3.4	0.2	0.6	4.7				0.8	0.7	0.5	11,380
	1949	legal	69.3	11.7	7.3	2.5	3.2	4.7				0.6	0.6	0.2	12,000
		all	66.4	10.5	14.6	1.6	2.7	3.1				0.4	0.4	0.2	16,700
	1950	legal	64.2	16.5	2.0	0.0	5.2	3.6				0.0	6.8	0.4	4,170
		all	74.5	12.4	2.5	0.0	3.8	2.0				0.0	3.8	0.2	7,540
Saddle Lake															
	1946	legal	70.5	10.4	7.3	2.5	0.02	1.5			0.1	5.2	2.3	0.1	28,300
		all	75.6	6.9	11.7	1.3	0.01	0.7			0.03	2.6	1.1	0.04	55,900
	1947	legal	63.1	24.3	2.5	2.4	0.1	1.7			0.05	4.5	1.3		41,400
		all	75.4	11.6	8.6	1.0	0.1	0.7			0.02	1.9	0.5		93,800
	1948	legal	77.6	11.2	0.7	2.7	0.01	2.7				5.0		0.2	18,500
		all	83.2	4.6	8.5	0.9	0.2	0.9				1.6		0.01	55,500
	1949	legal	82.8	5.8	1.3	2.2		2.6			0.05	5.2	0.05		23,100
		all	84.7	3.4	7.2	1.0		1.2			0.02	2.4	0.02		50,000
	1950	legal	79.8	8.5	2.7	3.0	0.0	2.6	0.03		0.07	3.0	0.00		31,780
		all	81.8	5.0	10.0	1.4	0.2	1.2	0.01		0.03	1.4	0.00		65,120

Table 1 (cont'd.)
 SPECIES COMPOSITION OF THE CATCH BY PERCENTAGE OF THE TOTAL CATCH
 ON TWELVE EXPERIMENTAL REGULATION LAKES
 1946-1950 Ice Free Seasons

Lake	Year	Size fish	Bluegills	Yellow perch	Pumpkinseed	Black crappie	Rock bass	Largemouth bass	Smallmouth bass	Walleye	Northern pike	Bullhead	Wormouth bass	Miscellaneous (a)	Estimated total fish
Craig Lake															
	1946		59.8	12.9	3.6	3.6	0.3	7.2			1.1	9.3	0.6	1.5	11,540
	1947		59.0	22.3	8.9	4.7	0.1	2.3			0.1	1.5	0.7		13,423
	1948		60.7	11.3	3.4	12.7		5.1			1.2	3.5	2.2		10,500
✓	1949	legal	43.8	27.2	10.5	0.3		4.9			4.6	6.7	1.0	1.3	11,030
		all	41.2	25.1	16.8	0.2		4.4			4.1	6.0	0.9	1.2	(b)
✓	1950	legal	41.0	37.8	19.0	4.0	0.1	3.2			2.0	2.5	1.7	0.6	13,300
		all	33.9	29.4	28.2	2.9	0.1	2.3			1.4	1.8	1.2	0.5	17,820
Duck Lake															
	1946		63.5	8.6	1.6	15.6	5.3	2.8	0.1	0.1	0.8	0.7	0.4	0.4	45,800
	1947		59.2	9.4	4.0	15.7	5.2	4.8	0.2		0.3	0.2	0.4		57,600
	1948		68.8	8.5	2.4	8.9	4.3	5.8	0.1		0.5	0.2	0.3		39,600
✓	1949	legal	60.1	8.6	4.5	11.8	4.5	6.9	0.2		0.9	0.6	1.5	0.4	22,800
		all	No "sub-legal" fish were recorded												
✓	1950	legal	46.2	26.0	8.2	4.5	6.4	5.6		0.3	1.8	0.3	0.5	0.3	26,160
		all	46.8	24.0	10.5	4.1	6.3	5.1		0.2	1.7	0.2	0.5	0.2	27,340
Fine Lake															
	1946		82.5	3.3	1.5	7.1	0.03	1.5		0.2	0.1	3.7	0.1		67,000
	1947		83.6	6.2	2.0	2.7		1.1	0.04	0.04	0.08	4.1			52,320
	1948		91.0	1.9	1.0	3.4	0.1	0.6			0.2	1.8		0.04	67,800
✓	1949	legal	81.8	4.7	1.9		8.6	1.2			0.5	1.2			69,630
		all	81.6	4.7	2.3		8.5	1.2			0.5	1.2			(b)
✓	1950	legal	79.8	8.2	1.7	7.1		0.7			0.3	1.5	0.7	0.4	31,850
		all	80.8	5.6	7.0	4.4		0.4			0.2	0.9	0.4	0.2	50,690

Table 1 (Cont'd)
 SPECIES COMPOSITION OF THE CATCH BY PERCENTAGE OF THE TOTAL CATCH
 ON TWELVE EXPERIMENTAL REGULATION LAKES
 1946-1950 Ice Free Seasons

Lake Year Size fish	Bluegills	Yellow perch	Pumpkinseed	Black crappie	Rock bass	Largemouth bass	Smallmouth bass	Walleye	Northern pike	Bullhead	Warmouth bass	(a) Miscellaneous	Estimated total fish
Lobdell Lake													
1946	49.3	9.1	8.4	24.9	0.2	2.8	0.1		0.6	4.6		0.1	41,000
1947	56.1	18.1	6.8	14.2	0.3	2.7			0.03	1.3	0.2	0.3	74,700
1948	61.6	14.5	5.5	14.2		1.6			0.1	2.4		0.04	88,700
✓ 1949 legal	70.3	9.5	12.6	4.7	0.3	0.8			0.7	0.9		0.1	46,300
all	70.5	9.5	12.6	4.7	0.3	0.8			0.7	0.9		0.1	(b)
✓ 1950 legal	64.0	7.2	10.2	14.6	1.0	1.1			0.6	1.5			22,860
all	68.7	7.1	10.5	10.8	0.7	0.8			0.4	1.0			30,710
Pontiac Lake													
1946	53.9	11.9	5.1	23.6	1.6	2.7			0.2	1.0		0.02	55,300
1947	82.3	6.4	5.2	3.8	0.4	1.3		0.1	0.05	0.3	0.01	0.06	199,000
1948	85.0	4.2	6.5	1.7	0.5	1.5			0.3	0.3			124,000
✓ 1949 legal	80.2	4.3	4.4	6.4	0.9	2.7			0.6			0.5	97,100
all	80.1	4.3	4.4	6.4	0.9	2.7			0.6			0.7	(b)
✓ 1950 legal	66.9	9.7	4.4	11.9	0.8	3.8			1.1	1.1		0.2	67,130
all	69.9	9.1	4.6	10.4	0.7	3.2			1.0	1.0		0.2	75,580
Whitmore Lake													
1946	59.2	15.4	6.2	4.9	1.1	4.9	0.5		3.6	4.1		0.07	37,390
1947	72.4	9.2	8.1	2.2	1.6	2.9	0.04		0.7	2.6	0.09	0.08	49,840
1948	73.6	7.3	7.5	0.5	2.8	4.2	0.06		1.2	2.7		0.06	51,100
✓ 1949 legal	57.5	18.5	14.3	3.7	1.1	2.8	0.2		0.9	1.1		0.08	68,700
all	57.5	18.4	14.2	4.0	1.0	2.8	0.1		0.9	1.0		0.07	(b)
✓ 1950 legal	40.5	26.0	5.9	20.7	0.2	1.7			1.4	3.6			13,000
all	42.4	26.3	6.4	18.4	0.6	1.5			1.2	3.2			14,640

Table 2

CREEL CENSUS STATISTICS ON TWELVE EXPERIMENTAL LAKES,
ICE-FREE SEASONS, 1946-1950

Lake, county and area	Season	Estimated total angler-trips					Five-year total:
		1946	1947	1948	1949	1950	
Big Portage Lake Jackson Co. 360 acres ✓	Spring	1,800	1,500	2,200	✓*	1,350	6,850 ✓
	Summer	2,500	2,900	3,600	1,700	2,700	13,400
	Fall	430	580	200	390	1,040	2,690
	Total	4,730	4,980	6,000	2,090	5,090	22,890 ✓
Fife Lake Grand Traverse Co. 575 acres ✓	Spring	1,500	940	1,300	1,600	1,450	6,790
	Summer	9,200	8,400	8,900	11,600	10,470	48,570
	Fall	360	1,100	800	530	520	3,310
	Total	11,060	10,440	11,000	13,730	12,440	58,670
Minnewaukon Lake St. Joseph Co. 126 acres ✓	Spring	1,500	1,900	1,100	1,100	1,180	6,780
	Summer	2,300	3,000	2,000	2,900	2,400	12,600
	Fall	270	700	250	670	740	2,630
	Total	4,070	5,600	3,350	4,670	4,320	22,010
Sugarloaf Lake Washtenaw Co. 180 acres ✓	Spring	2,600	1,100	2,300	2,700	2,310	11,010
	Summer	2,300	2,100	1,500	2,300	2,870	11,070
	Fall	340	420	250	740	430	2,180
	Total	5,240	3,620	4,050	5,740	5,610	24,260
Bear Lake Hillsdale Co. 117 acres ✓	Spring	630	1,100	1,400	1,700	890	5,720
	Summer	2,400	2,600	2,400	2,400	2,770	12,570
	Fall	320	580	140	560	240	1,840
	Total	3,350	4,280	3,940	4,660	3,900	20,130
Saddle Lake VanBuren Co. 271 acres ✓	Spring	3,000	4,400	2,100	2,500	3,110	15,110
	Summer	3,500	8,100	4,200	5,500	5,550	26,850
	Fall	420	1,100	450	1,000	410	3,380
	Total	6,920	13,600	6,750	9,000	9,070	45,340
Six lakes open to year-round bluegill and sunfish fishing	Spring	11,030	10,940	10,400	9,600 ✓*	10,290	52,260
	Summer	22,200	27,100	22,600	26,400	26,760	125,060
	Fall	2,140	4,480	2,090	3,890	3,380	15,980
	Total	35,370	42,520	35,090	39,890	40,430	193,300

✓* No census taken on Big Portage Lake, Spring 1949.

✓† Not catch per hour per angler. Catch per hour figures are given for all legal fish ("Legal") in one column, and for legal plus sub-legal fish ("All") in a second column under each year.

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Year	Estimated total legal catch					Five-year total	Estimated total legal catch		Estimated total legal catch
	1946	1947	1948	1949	1950		1946	1947	
✓	2,900	1,600	2,900	✓ 3,800	3,000	10,400 ✓			
	4,700	5,600	6,500	3,800	5,950	26,550			
	750	1,500	680	1,200	1,725	5,855			
✓	8,350	8,700	10,080	5,000	10,675	42,805 ✓			
	1,800	2,200	2,200	5,600	2,830	14,630			
	16,000	20,900	19,800	27,400	26,970	111,070			
	820	2,700	1,500	740	1,210	6,970			
	18,620	25,800	23,500	33,740	31,010	132,670			
	8,200	8,100	5,900	6,800	6,260	35,260			
	11,100	9,700	11,300	13,000	8,390	53,490			
	1,100	2,100	1,700	2,100	2,540	9,540			
	20,400	19,900	28,900	21,900	17,190	98,290			
	6,500	2,800	5,300	9,400	7,730	31,730			
	4,500	6,400	3,300	6,900	11,170	32,270			
	1,300	2,400	950	10,100	3,620	18,370			
	12,300	11,600	9,550	26,400	22,520	82,370			
	1,300	510	1,900	3,600	2,150	9,460	1,000	520	1,
	5,900	5,700	6,200	6,600	1,920	26,320	1,900	2,500	1,
	890	1,200	180	1,800	90	4,160	100	190	
	8,090	7,410	8,280	12,000	4,160	39,940	3,000	3,210	3,
	14,100	18,900	4,200	9,100	14,750	61,050	17,900	31,400	12,
	12,800	21,900	13,200	12,400	16,270	76,570	8,700	19,500	22,
	1,400	600	1,100	1,600	770	5,470	1,000	1,500	1,
	28,300	41,400	18,500	23,100	31,790	143,090	27,600	52,400	37,
	34,800	34,110	22,400	34,500 ✓	36,720	162,530 ✓	18,900	31,920	14,
	55,000	70,200	60,300	70,100	70,670	326,270	10,600	22,000	24,
	6,260	10,500	6,110	17,540	9,955	50,365	1,100	1,690	1,
	96,060	114,810	88,810	122,140	117,345	539,165	30,600	55,610	40,

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Estimated total sub-legal catch				Estimated total hours				
1948	1949	1950	Five-year total	1946	1947	1948	1949	1950
		1,470	1,470	6,460	4,520	9,290	*✓	3,900
		4,900	4,900	5,610	8,690	10,400	5,410	9,000
		75	75	1,370	1,630	720	1,300	3,400
		6,445	6,445	13,440	14,840	20,410	6,710	16,400
		2,380	2,380	4,630	3,200	4,820	5,860	4,500
		9,590	9,590	31,410	27,850	35,410	35,740	33,600
		540	540	1,130	2,920	2,550	1,700	1,500
		12,510	12,510	37,170	33,970	42,780	43,300	39,700
		4,840	4,840	4,390	4,990	3,180	2,500	2,500
		3,830	3,830	6,510	7,210	5,740	5,880	5,900
		910	910	740	1,920	630	1,520	1,800
		9,580	9,580	11,640	14,120	9,550	9,990	10,300
		1,610	1,610	9,250	3,670	7,970	10,660	8,200
		2,480	2,480	6,250	6,690	3,740	6,580	10,800
		430	430	990	1,330	800	2,740	1,500
		4,520	4,520	16,490	11,690	12,510	19,980	20,600
1,500	1,100	600	4,720	2,890	2,810	4,420	6,120	2,900
1,600	2,600	2,660	8,600	8,500	7,640	8,220	6,700	6,000
	1,000	115	1,405	1,300	1,840	360	1,620	400
3,100	4,700	3,375	14,725	12,690	12,290	13,000	14,440	9,400
12,500	7,800	19,170	88,770	12,780	16,490	9,600	8,670	11,300
22,700	18,600	12,920	82,420	11,220	21,840	12,300	14,050	14,800
1,800	500	1,240	6,040	1,180	2,420	1,250	1,010	1,100
37,000	26,900	33,330	177,230	25,180	40,750	23,150	23,730	27,200
14,000	8,900	30,070	103,790	40,400	35,680	39,280	33,810	33,500
24,300	21,200	36,380	114,480	69,500	79,920	75,810	74,360	80,400
1,800	1,500	3,310	9,400	6,710	12,060	6,310	9,890	10,000
40,100	31,600	69,760	227,670	116,610	127,660	121,400	118,060	123,000

1950	Five-year total	Catch per hour \downarrow										Five-year total	
		1946		1947		1948		1949		1950			
		Legal	All	Legal	All	Legal	All	Legal	All	Legal	All		
3,960	24,230 \checkmark	0.4		0.3		0.3		\checkmark		0.8	1.1	0.43	
9,050	39,160	0.6		0.7		0.6		0.6		0.7	1.2	0.68	
3,470	8,490	0.6		0.9		1.0		0.9		0.5	0.5	0.69	
16,480	71,880	0.5		0.5		0.5		0.7		0.6	1.0	0.60	
4,520	23,030	0.4		0.7		0.5		1.0		0.6	1.2	0.64	
33,680	164,090	0.5		0.8		0.7		0.8		0.8	1.1	0.68	
1,530	9,830	0.7		0.9		0.7		0.4		0.8	1.1	0.71	
39,730	196,950	0.5		0.8		0.7		0.8		0.8	1.1	0.67	
2,500	17,560	1.9		1.6		1.9		2.4		2.5	4.4	2.01	
5,920	31,260	1.8		1.3		2.0		2.2		1.4	2.1	1.71	
1,890	6,700	1.5		1.1		2.7		1.2		1.3	1.8	1.42	
10,310	55,520	1.8		1.4		2.0		2.1		1.7	2.6	1.77	
8,260	39,810	0.7		0.8		0.7		0.9		0.9	1.1	0.39	
10,860	34,120	0.7		1.0		0.9		0.9		1.0	1.3	0.95	
1,510	7,370	1.4		1.8		1.2		3.3		2.4	2.7	2.49	
20,630	81,300	0.8		1.0		0.8		1.1		1.1	1.3	1.01	
2,980	19,220	0.5	0.8	0.2	0.4	0.4	0.8	0.5	0.8	0.7	0.9	0.49	0.74
6,070	31,060	0.7	0.9	0.7	1.1	0.8	1.0	0.7	1.0	0.3	0.7	0.85	1.12
415	5,535	0.6	0.6	0.7	0.8	0.4	0.8	1.1	1.7	0.2	0.5	0.75	1.01
9,465	55,815	0.6	0.9	0.6	0.9	0.6	0.9	0.7	1.0	0.4	0.8	0.72	0.98
11,310	58,850	1.1	2.5	1.2	3.0	0.6	2.3	0.9	2.3	1.3	3.0	1.03	2.55
14,830	74,240	1.2	2.0	0.9	1.7	1.1	2.9	1.1	2.0	1.1	2.0	1.03	2.14
1,190	7,050	1.2	2.1	0.3	0.9	0.8	2.5	1.4	2.2	0.6	1.7	0.78	1.63
27,330	140,140	1.2	2.3	1.0	2.3	0.8	2.6	1.0	2.2	1.2	2.4	1.02	2.29
33,530	182,700	0.86		0.96		0.57		1.02		1.10	1.99	0.89	
80,410	380,000	0.79		0.88		0.80		0.94		0.88	1.33	0.86	
10,005	44,975	0.93		0.87		0.97		1.77		1.00	1.33	1.12	
123,945	607,675	0.82		0.90		0.73		1.03		0.95	1.51	0.89	

Table 2 (Concluded)
 CREEL CENSUS STATISTICS ON TWELVE EXPERIMENTAL LAKES,
 ICE-FREE SEASONS, 1946-1950

Craig Lake Branch Co. 122 acres ✓	Spring	410	380	440	480	780	2,490	240
	Summer	4,700	3,400	4,300	6,500	5,920	24,820	10,200
	Fall	470	850	160	670	470	2,620	1,100
	Total	5,580	4,630	4,900	7,650	7,170	29,930	11,540
Duck Lake Calhoun Co. 629 acres ✓	Spring	1,900	860	1,800	2,200	760	7,520	4,100
	Summer	12,900	17,700	12,900	15,600	11,670	70,770	34,300
	Fall	2,900	2,400	1,100	1,400	2,240	10,040	7,400
	Total	17,700	20,960	15,800	19,200	14,670	88,330	45,800
Fine Lake Barry Co. 320 acres ✓	Spring	1,400	450	1,500	1,900	880	6,130	2,200
	Summer	12,100	11,800	13,700	12,900	8,120	58,620	61,000
	Fall	1,100	1,400	710	1,200	1,090	5,500	3,800
	Total	14,600	13,650	15,910	16,000	10,090	70,250	67,000
Lobdell Lake Genesee Co. 545 acres ✓	Spring	1,900	1,800	4,700	1,300	740	10,440	3,200
	Summer	11,100	15,200	19,100	10,500	5,430	61,330	36,600
	Fall	610	2,300	1,200	1,300	90	5,500	1,200
	Total	13,610	19,300	25,000	13,100	6,260	77,270	41,000
Pontiac Lake Oakland Co. 585 acres ✓	Spring	2,400	3,600	5,200	4,800	1,460	17,460	4,200
	Summer	14,400	32,700	30,300	22,300	16,720	116,420	47,900
	Fall	980	4,200	880	1,500	430	7,990	3,200
	Total	17,780	40,500	36,380	28,600	18,610	141,870	55,300
Whitmore Lake Livingston Co. 677 acres ✓	Spring	1,200	1,700	1,600	1,600	540	6,640	690
	Summer	14,500	15,200	18,500	15,800	3,430	67,430	34,500
	Fall	1,000	2,300	1,200	1,700	590	6,790	2,200
	Total	16,700	19,200	21,300	19,100	4,560	80,860	37,390
Six lakes open to year-round fishing	Spring	9,210	8,790	15,240	12,280	5,160	50,680	14,630
	Summer	69,700	96,000	98,800	83,600	51,290	399,390	224,500
	Fall	7,060	13,450	5,250	7,770	4,910	38,440	18,900
	Total	85,970	118,240	119,290	103,650	61,360	488,510	258,030
Total of twelve lakes under experimental regulations	Spring	20,240	19,730	25,640	21,880 ✓	15,450	102,940	49,430
	Summer	91,900	123,100	121,400	110,000	78,050	524,450	279,500
	Fall	9,200	17,930	7,340	11,660	8,290	54,420	25,160
	Total	121,340	160,760	154,380	143,540 ✓	101,790	681,810	354,090

10	23	150	430	130	973			
10	9,400	10,200	8,800	11,420	50,020			
10	4,000	150	1,800	1,750	8,800			
10	13,423	10,500	11,030	13,300	59,793			
10	3,300	3,300	3,200	630	14,530			
10	50,600	32,600	18,300	20,380	156,180			
10	3,700	3,700	1,300	5,140	21,240			
10	57,600	39,600	22,800	26,150	191,950			
10	520	1,100	2,500	690	7,010			
10	46,900	65,500	66,300	29,140	268,840			
10	4,900	1,200	830	2,020	12,750			
10	52,320	67,800	69,630	31,850	288,600			
10	3,900	11,600	2,000	1,700	22,400			
10	60,000	73,600	38,600	20,830	229,630			
10	10,800	3,500	5,700	340	21,540			
10	74,700	88,700	46,300	22,870	273,570			
10	2,800	2,200	4,000	1,040	14,240			
10	185,000	119,300	90,400	64,020	506,620			
10	11,200	3,000	2,700	2,060	22,160			
10	199,000	124,500	97,100	67,120	543,020			
10	740	1,400	1,700	1,720	6,250			
10	44,700	48,100	63,000	8,040	198,340			
10	4,400	1,600	4,000	3,240	15,440			
10	49,840	51,100	68,700	13,000	220,030			
10	11,283	19,750	13,830	5,910	65,403			
10	396,600	349,300	285,400	153,830	1,409,630			
10	39,000	13,150	16,330	14,550	101,930			
10	446,880	382,200	315,560	174,290	1,576,963			
10	45,393	42,150	48,330	42,630	227,933	18,900	31,920	14,000
10	466,800	409,600	355,500	224,500	1,735,900	10,600	22,000	24,300
10	49,500	19,260	33,870	24,505	152,295	1,100	1,690	1,800
10	561,693	471,010	437,700	291,635	2,116,128	30,600	55,610	40,100

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			1,520	1,070	1,550	1,640	3,330	9,...
4,270	4,270	14,700	10,100	12,400	15,800	14,360	67,...	
380	380	1,270	2,800	360	2,260	1,400	8,0	
4,650	4,650	17,490	13,970	14,310	19,700	19,090	84,5	
		6,310	2,500	5,540	6,130	3,010	23,4	
1,690	1,690	36,100	47,700	40,700	45,300	31,180	200,9	
130	130	7,630	6,670	3,300	3,390	6,370	27,3	
1,820	1,820	50,040	56,870	49,540	54,820	40,560	251,8	
20	20	3,890	1,360	4,020	4,550	2,330	16,1	
15,010	15,010	33,500	28,800	36,800	41,000	22,060	162,1	
1,810	1,810	2,740	3,540	1,680	2,630	2,870	13,4	
16,840	16,840	40,130	33,700	42,500	48,180	27,260	191,7	
		6,450	5,960	16,500	8,350	3,170	40,4	
9,400	9,400	45,300	59,500	67,500	39,000	23,760	235,0	
130	130	1,810	7,260	3,030	3,680	360	16,1	
9,530	9,530	53,560	72,720	87,030	51,030	27,290	291,6	
		10,400	12,600	20,200	24,200	5,500	72,9	
8,200	8,200	68,400	135,700	128,100	105,200	77,540	514,9	
1,300	1,300	4,290	17,620	3,380	5,840	2,140	33,27	
9,500	9,500	83,090	165,920	151,680	135,240	85,180	621,11	
28	28	3,550	4,670	4,970	6,620	1,840	21,65	
1,550	1,550	50,800	45,100	65,600	56,000	12,080	229,58	
60	60	4,250	7,380	4,190	6,230	2,020	24,07	
1,638	1,638	58,600	57,150	74,760	68,850	15,940	275,30	
48	48	32,120	28,160	52,780	51,490	19,180	183,73	
40,120	40,120	248,800	326,900	351,100	302,300	180,980	1,410,08	
3,810	3,110	21,990	45,270	15,940	24,030	15,160	122,39	
43,978	43,978	302,910	400,330	419,820	377,820	215,320	1,716,20	
8,900	30,118	103,838	72,520	63,840	92,060	85,300	52,710	366,430
21,200	76,500	154,600	318,300	406,820	426,910	376,660	261,390	1,790,080
1,500	7,120	13,210	28,690	57,330	22,250	33,920	25,165	167,350
31,600	113,738	271,648	419,510	527,990	541,220	495,880	339,265	2,323,865

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9,110	0.1	0.02	0.1	0.3	0.05	0.05	0.11
67,360	0.7	0.9	0.8	0.5	0.8	1.1	0.74
8,090	0.8	1.4	0.4	0.7	1.3	1.5	1.09
84,560	0.6	0.9	0.7	1.1	0.7	0.9	0.71
23,490	0.7	1.3	0.6	0.3	0.2	0.2	0.62
00,980	1.0	1.0	0.8	0.5	0.7	0.7	0.78
27,360	1.0	0.6	1.1	0.4	0.8	0.8	0.78
51,830	0.9	1.0	0.8	0.4	0.6	0.7	0.76
16,150	0.7	0.4	0.3	0.7	0.3	0.3	0.43
62,160	1.8	1.7	1.8	1.6	1.3	2.0	1.66
13,460	1.2	1.4	0.7	0.3	0.7	1.3	0.95
91,770	1.5	1.5	1.5	1.3	1.2	1.8	1.51
40,430	0.6	0.7	0.7	0.1	0.7	0.7	0.55
35,060	0.8	0.9	1.1	0.8	0.9	1.3	0.98
16,140	0.7	1.4	1.2	1.3	0.9	1.3	1.33
91,630	0.7	0.9	1.0	0.7	0.8	1.2	0.94
72,900	0.4	0.2	0.1	0.1	0.2	0.2	0.20
14,940	0.7	1.4	0.9	0.7	0.8	0.9	0.98
33,270	0.8	0.6	0.9	0.5	1.0	1.6	0.67
21,110	0.6	1.2	0.8	0.6	0.8	0.9	0.87
21,650	0.2	0.2	0.3	0.2	0.8	1.0	0.29
29,580	0.7	1.0	0.7	1.0	0.7	0.8	0.86
24,070	0.6	0.6	0.4	0.5	1.6	1.6	0.64
75,300	0.6	0.8	0.6	0.8	0.8	0.9	0.80
83,730	0.46	0.40	0.37	0.27	0.31	0.31	0.36
410,080	0.90	1.21	0.99	0.94	0.85	1.07	1.00
22,390	0.86	0.86	0.82	0.68	0.96	1.21	0.83
16,200	0.85	1.12	0.91	0.84	0.81	1.01	0.92
66,430	0.68	0.71	0.46	0.57	0.81	1.38	0.62
90,080	0.88	1.15	0.96	0.94	0.86	1.15	0.97
67,355	0.88	0.86	0.87	1.00	0.97	1.26	0.91
23,865	0.84	1.06	0.87	0.88	0.86	1.19	0.91

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