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INTENSIVE SUMMER CREEL CENSUS ON BEAR

LAKE, HILLSDALE COUNTY

by

Michael W. Pawlick

Bear Lake, believed to be fairly representative of southern Michigan waters, was chosen in the fall of 1938 for intensive creel census primarily to determine the effect of winter fishing on summer fishing. Creel census has been continuous since that time. The lake is fished quite heavily during both the summer and winter seasons. Bear Lake is located in Cambria Township, Hillsdale County, T. 7 S., R. 3 W., Secs. 8, 17. It is open to the public.

The lake has an area of 117 acres and a maximum depth of 50 feet. The bottom consists of marl, pulpy and fibrous peat. The shore line is about two-thirds marsh and brush with some wooded area and a limited amount of high land pretty well developed in cottage sites. The drop-offs are rapid from shallow to deep. Inlets are from springs and from Pike and Wilson lakes, and in years of high water level from Fowler Lake. The outlet is into the St. Joseph River.

Since 1938, an intensive creel census study has been in progress and will continue for at least several more years. Under commission order effective June 25, 1945, the size limit was removed on pan fish, (bluegill,

sunfish, perch, crappies, and rock bass). The size limit on bass was retained, also the daily limit of 25 pan fish not more than 15 of which could be bluegills. This information was passed on to the fishermen by posting and through the creel census clerk, conservation officers, and local sportsman's clubs. With these precautions taken we are reasonably sure that the undersize fish caught were kept by any who cared to do so. A carbon copy of the creel census report served as authority for the fisherman to have these undersize pan fish for a period not to exceed three days after date of capture.

The purpose of this study is to test the value, or lack of value, of size limits on pan fish in this lake.

Due to a misunderstanding, the data obtained during 1945 are incomplete. Complete information is lacking on the total number of ^{un}successful fishermen and for some records the hours fished and the size of the fish. Under these circumstances the work sheet had to be altered from previous years. All calculations, such as catch per hour, average hours fished, average catch per man per day, and others are based on the 986 successful fishermen days reported by the clerk, (Earl Ley, a year-round cottage resident of Bear Lake). The information on these fishermen is complete or sufficient to give a good cross section of the successful fishermen. The usable data obtained will be divided into two groups, legal fish caught and undersized fish kept.

Data obtained

Census returns were received for 986 successful fishermen days. All fishing recorded took place from June 25 to October 15 inclusive. There was a daily average of 8.80 successful fishermen per day. Opening week had the greatest number of successful fishermen, an average of 21.57 per day. (See Table 1.)

Table 1.--Number of successful fishermen, average hours fished per day, average number of fishermen per day; and fish taken, catch per hour, fish per angler, average size of fish for both legal-sized and undersized fish, summer of 1945

Date	Successful fishermen	Av. hours fished per day	Av. number of fishermen per day	Legal fish taken	Catch per hour	Fish per angler	Av. size of fish	Undersized fish taken	Catch per hour	Fish per angler	Av. size of undersized fish
June 25-July 1	151	4.65	21.57	732	1.41	4.84	8.05	92	0.13	0.61	5.38
July 2-July 8	116	5.37	16.57	508	0.89	4.37	7.05	110	0.18	0.94	5.00
July 9-July 15	64	4.58	9.14	209	0.86	3.26	6.86	51	0.17	0.79	5.20
July 16-July 22	86	5.14	12.28	279	0.66	3.24	7.21	140	0.30	1.62	4.76
July 23-July 29	75	5.37	10.71	346	0.86	4.61	7.07	111	0.27	1.48	5.10
July 30-Aug. 5	52	5.17	7.42	231	0.98	4.44	7.36	14	0.05	0.27	4.57
Aug. 6-Aug. 12	88	5.20	12.57	243	0.59	2.76	7.47	39	0.09	0.44	4.78
Aug. 13-Aug. 19	94	4.78	14.00	341	0.82	3.63	7.40	63	0.14	0.67	4.66
Aug. 20-Aug. 26	31	5.53	4.42	105	0.63	3.38	7.25	84	0.48	2.70	5.00
Aug. 27-Sept. 2	53	6.29	7.43	231	0.79	4.36	7.39	29	0.09	0.54	4.60
Sept. 3-Sept. 9	72	6.78	10.28	240	0.49	3.33	7.80	28	0.06	0.39	5.00
Sept. 10-Sept. 16	33	6.53	4.71	75	0.35	2.27	7.77	28	0.13	0.85	5.00
Sept. 17-Sept. 23	33	6.29	4.71	179	0.86	5.42	7.65	2	0.01	0.06	5.50
Sept. 24-Sept. 30	16	6.06	2.28	93	0.96	5.81	7.61	0	0.00	0.00	0.00
Oct. 1-Oct. 7	12	4.08	1.71	77	1.31	6.41	8.33	0	0.00	0.00	0.00
Oct. 8-Oct. 14	10	3.75	1.42	94	2.51	9.40	8.76	0	0.00	0.00	0.00
Total or average	986	5.35	8.80	3,983	0.87	4.03	7.59	791	0.18	0.79	4.96

Number of fish, catch per hour, fish per fisherman day, and average size on both legal and undersized fish.

The 986 fisherman days yielded a total of 4,779 fish of which 3,983 were of legal size and 796 were undersized fish. The legal-sized fish averaged 7.59 inches and were caught at the rate of 0.87 per hour. The undersized fish averaged 4.96 inches and were taken at the rate of 0.18 per hour. The fisherman averaged 4.0 legal and 0.79 undersized fish per fishing day. The lake produced on an average more than 42 fish per day for a period of 112 days, of which 35 per day were of legal size and 7 per day were undersized. The average fisherman day was 5.35 hours.

The largest number of fish caught during any one week period was for the opening week when 732 fish were taken by 151 fishermen who fished on an average of 4.6 hours with a catch per hour of 1.41. This is also the highest catch per hour for the season except for the final week, October 8 through October 14. For this period there was a catch per hour of 2.51. A total of 94 fish were taken of which more than 50 percent were bullheads. These bullheads composed more than a third of the bullheads caught during the season.

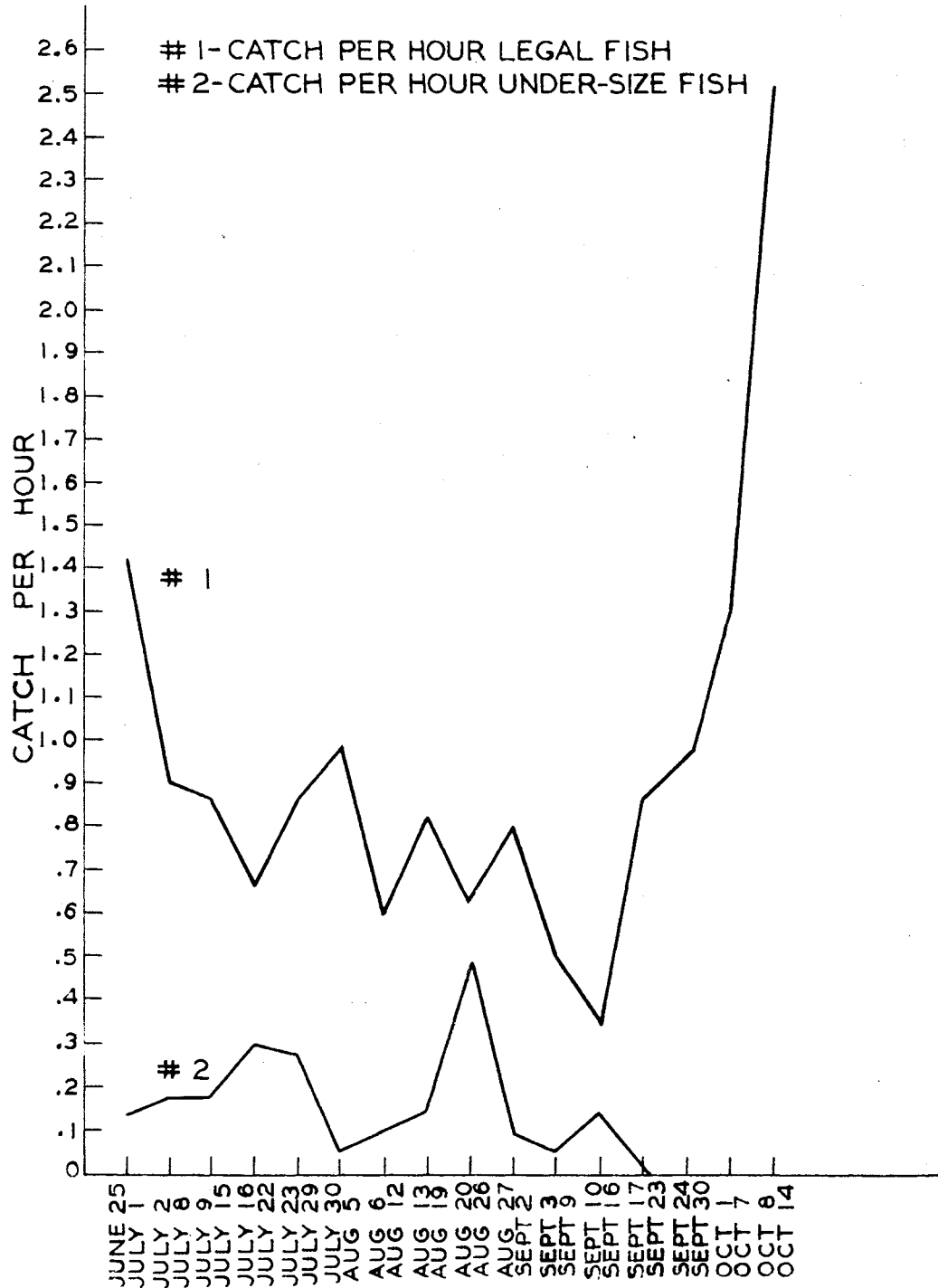
The weekly variations for total catch, catch per hour, average hours fished, and fish per angler were great and erratic, so that no correlations could be seen. (See Table 1.)

There is a slight correlation between the catch per hour of legal and undersized fish. A slight tendency was noted for the catch per hour of undersized fish to increase when the catch per hour of legal fish goes down. (See Graph 1.)

Analysis of the catch by species

The data collected on this summers work are divided into two categories, legal and undersized fish. For convenience these will be treated separately.

CATCH PER HOUR OF LEGAL AND UNDER-SIZED FISH BEAR LAKE SUMMER OF 1945



GRAPH 1

Legal-sized fish taken (See Table 2 and Graph 2)

A total of nine species were taken during the summer. Listed according to abundance are: bluegill, yellow perch, largemouth bass, bullheads, rock bass, sunfish, crappies, warmouth bass, and one smallmouth bass which probably was an error in identification.

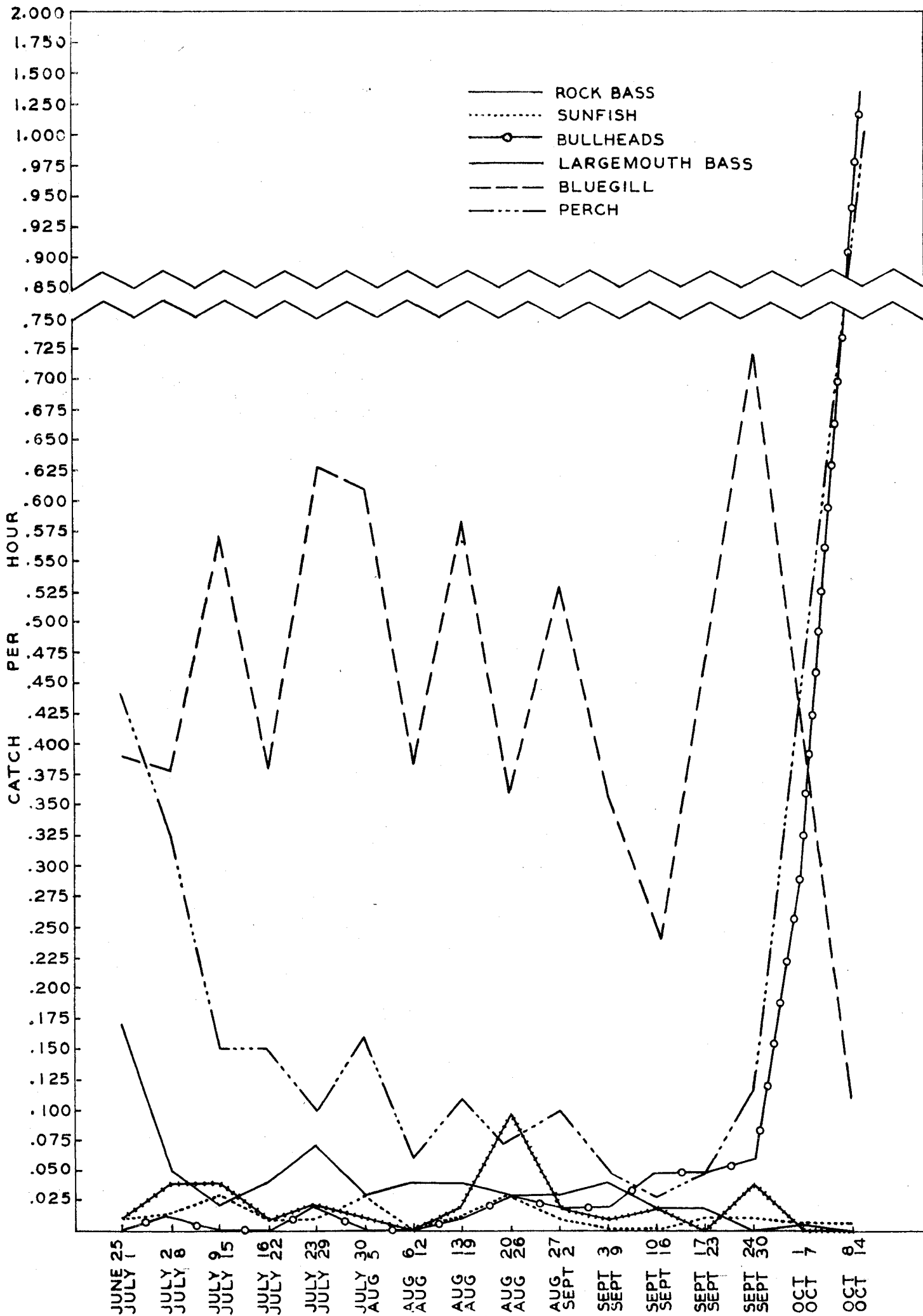
A total of 2,406 bluegills were taken, with an average of 7.00 inches in length. The bluegills composed 60^{percent} of the total catch and were caught at the rate of 1 for every 2 hours fished. The fluctuation of catch per hour was great throughout the season. The greatest drop was during the last week of fishing, when the catch per hour dropped to 0.11 or 1 fish for every 10 hours fished. However, consideration must be given to the fact that about 40 percent of the hours fished during this period were after dark for bullheads. If this factor is considered the catch per hour of bluegills would be about normal for the season. The size of the bluegill did vary some during the season with a tendency toward larger fish at the later end.

A total of 951 yellow perch were removed during the season, with an average of 7.16 inches in length and at the rate of 1 fish for every 5 hours fished. The yellow perch composed about 24 percent of the total catch. The catch per hour fluctuated during the season. The fluctuation may be accounted for by several reasons; first, the perch is a cool water fish and bites best in spring, fall, and winter; second, bluegill fishing dropping off, the fishermen concentrated their efforts toward other species perch being one of these; and third, during the early part of the season more fishermen were fishing for bass, probably using minnows for bait, catching more perch than otherwise would have been taken.

A total of 302 largemouth bass were caught during the season of which 40 percent of these were taken in the first week of fishing. The size

Table 2.--Analysis of the catch of legal-sized fish, Bear Lake summer 1945

Date	Largemouth bass			Bluegill			Perch			Sunfish			Rock bass			Bullheads		
	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour
June 25-July 1	120	12.66	0.17	276	7.11	0.39	307	7.14	0.44	7	7.00	0.01	8	7.00	0.01	3	8.66	0.00
July 2-July 8	33	11.22	0.05	241	6.54	0.38	200	7.02	0.32	7	6.07	0.01	25	6.64	0.04	4	9.75	0.01
July 9-July 15	6	11.16	0.02	137	6.73	0.57	43	6.74	0.15	9	6.00	0.03	13	7.00	0.04	0	0.00	0.00
July 16-July 22	20	13.20	0.04	178	6.73	0.38	70	6.82	0.15	4	6.75	0.01	7	6.00	0.01	1	12.00	0.00
July 23-July 29	30	12.11	0.07	253	6.53	0.63	42	6.80	0.10	3	6.00	0.01	8	6.75	0.02	9	8.77	0.02
July 30-Aug. 5	7	11.50	0.03	164	7.23	0.61	42	7.40	0.16	8	6.00	0.03	3	6.33	0.01	2	10.00	0.00
Aug. 6-Aug. 12	20	12.25	0.04	175	7.01	0.38	30	6.97	0.06	2	6.00	0.00	1	7.00	0.00	1	9.00	0.00
Aug. 13-Aug. 19	19	12.97	0.04	264	7.08	0.58	51	6.84	0.11	5	6.60	0.01	9	6.66	0.02	4	10.50	0.01
Aug. 20-Aug. 16 ²⁴	6	11.91	0.03	62	6.97	0.36	12	6.75	0.07	5	6.00	0.03	17	6.85	0.10	5	9.00	0.03
Aug. 27-Sept. 2	10	13.70	0.03	176	7.09	0.53	32	7.31	0.10	3	6.00	0.01	5	6.40	0.02	7	9.00	0.02
Sept. 3-Sept. 9	21	11.90	0.04	177	7.44	0.36	26	7.46	0.05	1	6.00	0.00	6	6.17	0.01	8	8.63	0.02
Sept. 10-Sept. 16	4	11.75	0.02	51	7.43	0.24	6	7.00	0.03	0	0.00	0.00	4	6.25	0.02	10	9.00	0.05
Sept. 17-Sept. 23	3	12.33	0.02	154	7.37	0.74	10	8.70	0.05	1	6.00	0.01	0	0.00	0.00	10	9.60	0.05
Sept. 24-Sept. 30	0	00.00	0.00	70	7.50	0.72	12	8.25	0.12	1	6.00	0.01	4	6.00	0.04	6	9.00	0.06
Oct. 1-Oct. 7	3	10.66	0.05	24	7.60	0.41	28	7.96	0.47	3	6.00	0.05	0	0.00	0.00	19	9.79	0.32
Oct. 8-Oct. 14	0	00.00	0.00	4	6.50	0.11	40	8.23	1.07	2	6.00	0.05	0	0.00	0.00	51	9.42	1.36
Totals or averages	302	12.35	0.06	2,406	7.00	0.46	951	7.16	0.18	61	6.21	0.02	110	6.59	0.02	140	9.31	0.03
Percent of total catch	7.57	...	...	60.41	...	...	23.87	...	...	1.53	...	...	2.83	...	...	3.59	...	...



Graph 2. Average catch per hour by species for legal-sized fish.

varied through the season with an average of 12.35 inches. One bass was caught for every 20 hours of fishing.

The bullheads had a very slow start and the catch per hour was very small until the last two weeks of fishing. At this time about 40 percent of the total hours fished was concentrated on bullheads, producing 50 percent of all the bullheads removed during the season. The catch per hour during the last two weeks was 1.36. The average size for the season was 9.31 inches.

A total of 110 rock bass and 61 sunfish were taken during the season. The remaining three species--crappie, warmouth bass, and a doubtful small-mouth bass composed less than 0.5 of 1 percent of the total catch.

Undersize fish (See Table 3.)

Pan fish less than six inches in length of four species were removed during the season--bluegills, sunfish, yellow perch, and rock bass. Only 796 fish of these four species were kept by the fishermen during the season. Presumably these figures on the number of undersized pan fish kept by fishermen do not represent the total number of such fish caught. Anyone fishing with worms or small flies would be almost certain to catch some pan fish under the six-inch size. Whether they kept these fish probably depended upon their personal feelings about the size limit. No doubt many fishermen still believe that the small fish should be returned to insure their future fishing. Others are probably deterred by their expectations of taking larger fish later, not wanting to have the small fish counted in their daily limit. Others may have felt as many anglers do that even a six-inch pan fish is hardly worth cleaning. A number of fishermen have their own size limit--6 1/2 or 7 inches or even larger, which they hold to except perhaps when fishing is very poor and they need smaller fish to make a decent meal. Children and some adults want to keep every fish

Table 3.--Analysis of the catch of undersized fish, Bear Lake, summer 1945

Date	Bluegill			Rock bass			Yellow perch			Sunfish		
	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour	Number taken	Av. size	Per hour
June 25-July 1	54	5.38	0.08	5	5.10	0.01	13	5.50	0.02	18	5.38	0.05
July 2-July 8	92	5.00	0.15	0	0.00	0.00	3	4.66	0.01	12	5.13	0.02
July 9-July 15	27	5.31	0.09	2	5.00	0.01	0	0.00	0.00	22	5.09	0.07
July 16-July 22	116	4.67	0.25	0	0.00	0.00	14	5.46	0.00	10	4.90	0.02
July 23-July 29	67	5.03	0.17	1	5.00	0.00	2	5.00	0.00	41	5.24	0.10
July 30-Aug. 5	14	4.57	0.05	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Aug. 6-Aug. 12	47	4.81	0.10	2	4.00	0.00	0	0.00	0.00	2	5.00	0.00
Aug. 13-Aug. 19	48	4.54	0.11	2	4.00	0.00	6	5.00	0.01	7	5.43	0.02
Aug. 20-Aug. 26	66	4.97	0.38	2	5.00	0.01	0	0.00	0.00	14	5.18	0.08
Aug. 27-Sept. 2	23	4.50	0.07	0	0.00	0.00	0	0.00	0.00	6	5.00	0.02
Sept. 3-Sept. 9	26	5.00	0.05	0	0.00	0.00	2	5.00	0.00	0	0.00	0.00
Sept. 10-Sept. 16	28	5.00	0.13	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Sept. 17-Sept. 23	0	0.00	0.00	0	0.00	0.00	2	5.50	0.01	0	0.00	0.00
Sept. 24-Sept. 30	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Oct. 1-Oct. 7	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Oct. 8-Oct. 14	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Totals or averages	608	4.91	0.12	14	4.61	0.00	42	5.31	0.01	132	5.15	0.03
Percent of total catch	76.7	...	...	1.6	...	...	5.2	...	...	16.5	...	...

they catch regardless of size but they are believed to make up a small percentage of all fishermen.

One other factor may be considered, that many of the fishermen caught their limit of pan fish and only kept the legal-sized fish. On compiling the data this does not prove to be the case. During the season there were 15 fishermen who took their limit, of these, six were limit takes of bass. Bass must be of legal-size to be kept and would not affect the number of undersized fish kept. The remaining 9 who caught their limit can be divided into three groups. The first group consisted of all legal-sized fish--a daily limit of 15 bluegills and 10 other pan fish. There were 4 fishermen that came in this group. The second group consisted of a limit catch of pan fish but included undersized fish to attain the daily quota. This group has only 1 fisherman. In the third and last group 4 fishermen took their limit in legal size bluegills but no other pan fish. If these data are indicative and conclusive it may be said that at a maximum only 4 fishermen could not take undersize fish because of limit takes of legal-sized fish.

A total of 608 bluegills were kept making 76 percent of the total undersized catch. The average size for the season was 4.91 inches.

A total of 132 sunfish was taken, making up 16.5 percent of the total catch, with an average length of 5.15 inches.

The 42 yellow perch had an average size of 5.31 inches and composed 5.2 percent of the total catch.

The 14 rock bass with an average size of 4.61 inches made up 1.6 percent of the total catch.

The catch per hour for these four species will be found in Table 3. Because the catch per hour for individual species is so small and of so little use except for comparisons, it was not entered here.

Up to this point all figures quoted were on successful fishermen whose tally sheets were complete. We have reason to believe that our census is complete as to the total number of fish of each species caught. A total of 5,683 fish were kept, of these 4,572 were of legal size, 932 undersize and 179 had no size recorded. These 179 unrecorded fish were divided proportionally between the legal and undersize fish by using the percent of each in the known recorded catch. This changes the total of undersize fish to 962 and legal fish to 4,721. These figures will be used in the calculations of the catch per acre by species. (Table 4)

The lake produced a total of 40.35 legal fish and 8.22 undersized fish per acre. Bluegills were by far the most plentiful with a catch of 24.37 legal fish per acre and 6.3 undersized fish per acre. Yellow perch were second in the legal size with 9.37 fish per acre. Of the undersized fish caught, the sunfish were second with a catch of 1.36 fish per acre. The large mouth bass were third with a catch of 3.05 fish per acre. The remaining five species of legal-sized fish produced only 3.56 fish per acre and the two remaining species of undersized fish produced only 0.56 fish per acre. The catch per acre for the individual species can be had by consulting Table 4.

Analysis of fishermen who kept undersized fish

Of the 962 undersize fish taken, creel census returns were complete for 796; of these only two were caught during the last month of fishing. Only 18.8 percent of the successful fishermen kept undersized fish.

Analysis of data collected on summer fishing from 1938 to 1945

All the figures quoted will be on successful fishermen in order to make valid comparisons with the summer records for 1945.

Number of fishermen days each year and per acre pressure

The average number of successful fishermen days for the period of 1938 to 1945 inclusive was 1,450 fisherman days per year and an average

Table 4.--Catch per acre by species, for summers
of 1938 to 1945, Bear Lake--117 acres

	1938	1939	1940	1941	1942	1943	1944	Legal 1945	Undersize 1945
All species	70.80	54.96	33.08	68.89	47.69	58.27	62.57	40.35	8.22
Largemouth bass	5.63	3.57	4.68	5.83	2.72	4.01	3.39	3.05	...
Bluegills	45.45	35.13	11.15	48.72	35.32	42.27	44.62	24.37	6.30
Sunfish	2.74	1.26	1.18	1.87	1.18	2.48	0.87	0.61	1.36
Yellow perch	5.77	7.57	5.48	5.72	4.26	3.94	9.32	9.37	0.43
Rock bass	4.00	1.95	1.27	2.08	1.09	1.14	1.34	1.14	0.13
Crappie	0.99	0.66	0.09	0.33	0.25	0.32	0.34	0.14	...
Warmouth bass	0.80	0.67	0.31	0.45	0.28	0.85	0.12	0.02	...
Bullheads	3.54	3.37	8.36	4.56	2.44	3.15	2.43	1.44	...

Table 5.--Average hours fished, average catch per angler per day,
and catch per hour, Bear Lake, summers of 1938 to 1945

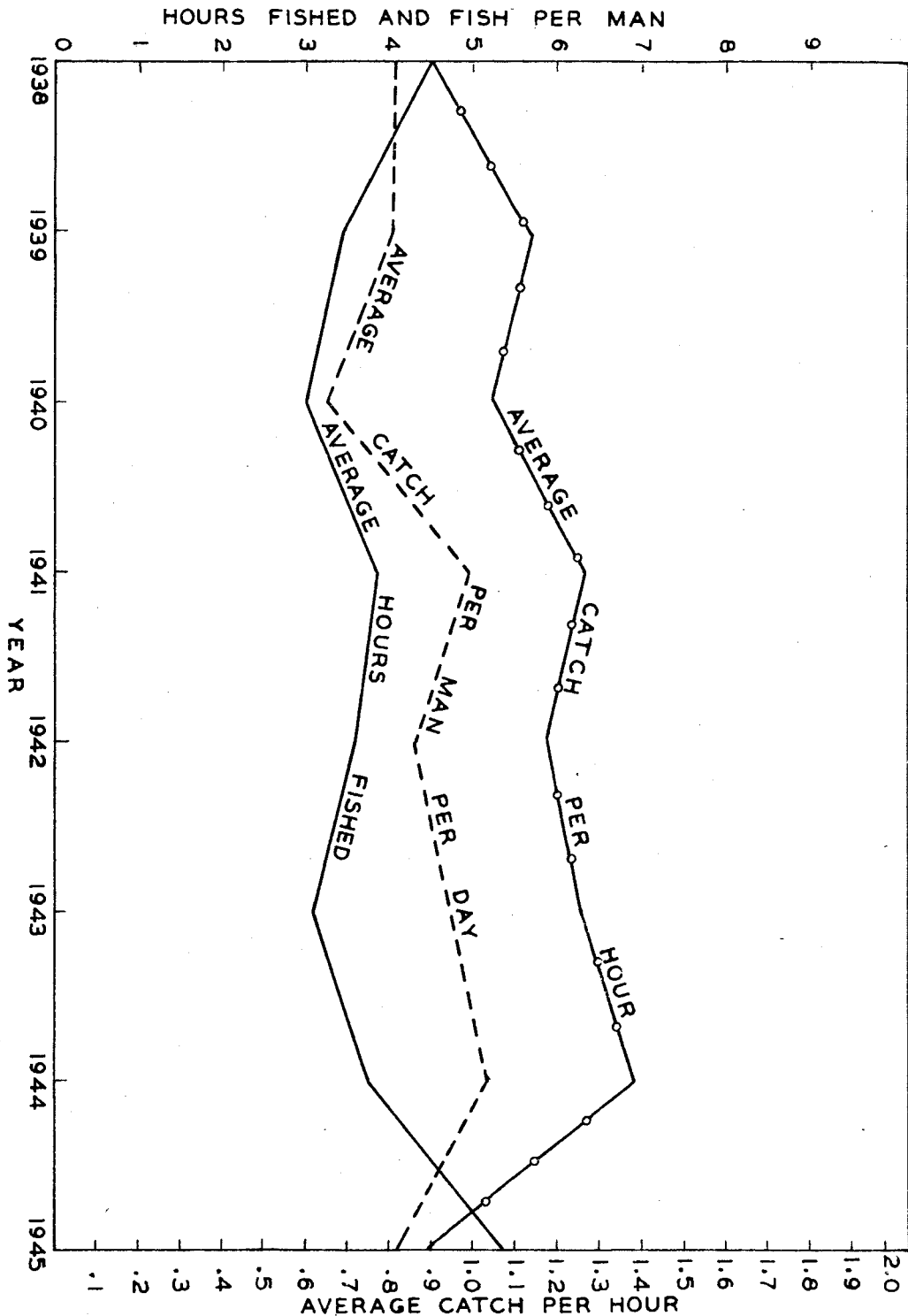
	1938	1939	1940	1941	1942	1943	1944	Legal 1945	Undersize 1945
Average hours fished	4.49	3.48	3.09	3.93	3.61	3.06	3.74	5.35	5.35
Average catch per man per day	4.06	4.01	3.24	4.98	4.27	4.72	5.19	4.04	0.80
Catch per hour	0.90	1.15	1.05	1.27	1.18	1.26	1.38	0.87	0.15

of 12.4 fisherman days per acre. The greatest fishing pressure existed during the year of 1938, when there was a total of 2,040 fisherman days and 17.4 fisherman days per acre. This year proved to be the most productive in number of fish caught, however, the catch per hour does not equal those of other years. The year of least pressure occurred in 1945, with a low of 986 fisherman days and 8.2 fisherman days per acre. Although the pressure was the lightest, the total catch was also one of the poorest. The most unproductive year during this period was 1940 when a total of 1,195 fisherman days produced only 3,871 fish.

The fishing pressure was reduced in 1942 to 1945 inclusive. It is possible that wartime restrictions were partly responsible for this decrease.

Average hours fished, average catch per man per day, and catch per hour
Table 5 and Graph 3

No definite correlation can be seen between these three factors. Individual years show different trends. In 1940 the average catch per fisherman day is low and the average hours fished is low. Again in 1942 when the catch is on the decline the hours fished is low compared with the previous year. This seems to indicate that the fishermen would fish fewer hours when they weren't taking many fish. To support this statement in 1941 the catch per fisherman day was high and the hours fished increased so that it could be said that the hours fished depended upon the take of fish. However, just the opposite can be seen in 1938 and 1945. In these years there is a slight indication that the fishermen fished more hours for the fish caught. This seems to indicate that when fishing is poor the fishermen will fish much longer to get approximately the same number of fish. In 1943 and 1944 when the catch per hour was good the fishermen spent less time fishing even though more fish per fisherman day were taken.



Graph 3. Yearly averages for length of fishermen day, catch per man per day, and catch per hour of fish. Bear Lake, Hillsdale County, 1938-1945.

Yearly total number of fish and percents by species. (See Tables 6 and 7 also Graph 4)

The total number of fish taken each year varied with the number of fishermen and hours fished.

The largemouth bass, bluegill, and yellow perch have composed from 64 percent to 92 percent of the total fish taken in any year. In 1940 these three species made up 63 percent of the total catch. Excluding this year these three species definitely dominate the catch. There has been a steady yearly increase from 78 percent to 92 percent of the total catch.

Each year except for 1940 the bluegill has composed at least 60 percent of the catch and as high as 74 percent in 1942.

The largemouth bass made up between 5 percent and 8 percent of the total catch each year except in 1940 when the largemouth bass averaged 14 percent, but the total number of bass taken that year did not vary a great deal from previous and succeeding years.

The yearly variations of yellow perch are great and inconsistent. There is no definite trend in the variation. This species makes up anywhere from 7 percent to 24 percent of the total yearly catch.

The sunfish, crappie, rock bass, and warmouth bass compose anywhere from 4.5 percent to 12 percent of the yearly catch. The trend at the present time is for these species to be crowded out by the predominating three species.

The only other fish of importance is the bullhead. It totals from 3.5 to 6.5 percent of the yearly catch. In 1940 the bullhead composed 25 percent of the total catch. This is partly due to the comparatively small number of bluegills taken. Actually about twice the number of bullheads had been taken that year than in any other year.

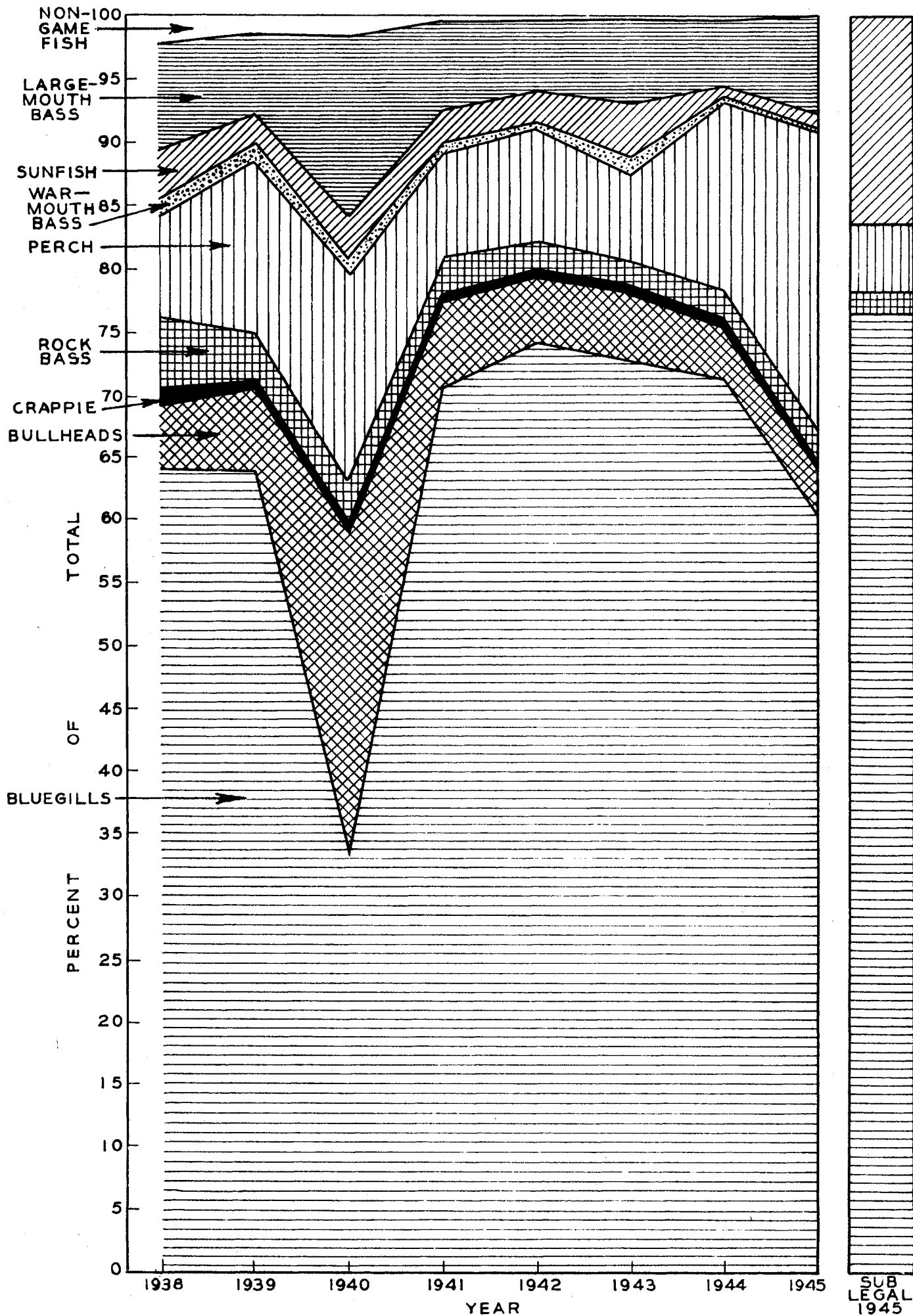
Carp, mud pike, dogfish, and gar pike were also caught, but were taken in such small numbers that they constituted an insignificant portion of the total catch.

Table 6.--Total number of fish by species, for
summers of 1938 to 1945--Bear Lake

	1938	1939	1940	1941	1942	1943	1944	Legal 1945	Undersize 1945
Total fish	8,292	6,431	3,871	8,060	5,580	6,818	7,321	^{3,985} 3,983	796
Largemouth bass	659	418	547	565	318	469	397	302	...
Bluegills	5,318	4,110	1,305	5,700	4,133	4,946	5,221	2,406	608
Sunfish	321	147	138	219	138	290	102	61	132
Yellow perch	676	886	641	669	498	461	1,091	951	42
Rock bass	469	228	149	244	128	134	157	110	14
Crappie	116	77	11	39	29	38	40	13	...
Warmouth bass	94	79	36	53	33	100	14	2	...
Bullheads	414	394	978	534	285	369	285	140	...

Table 7.--Percentage of the total catch for each year by
species, Bear Lake, summers of 1938 to 1945

	1938	1939	1940	1941	1942	1943	1944	Legal 1945	Undersize 1945
Number of successful fishermen	2,040	1,603	1,195	1,617	1,305	1,443	1,409	986	986
Total fish	8,292	6,431	3,871	8,060	5,580	6,818	7,321	^{3,985} 3,983	796
Largemouth bass	7.95	6.50 ^x	14.31	7.01	5.69	6.88	5.40	^{7.58} 7.75	...
Bluegills	64.13	63.91 ^w	33.71	70.68	74.07	72.54	71.30	^{60.98} 60.40	76.40
Sunfish	3.87	2.28 ^x	3.56	2.72	2.47	4.26	1.40	1.53 ^v	16.50
Yellow perch	8.15	13.78 ^a	16.56	8.30	8.91	6.78	14.90	^{23.86} 23.87 ^v	5.30
Rock bass	5.65	3.54 ^w	3.85	3.02	2.29	1.97	2.10	^{2.76} 2.83	1.70
Crappie	1.39	1.20 ^w	0.28	0.48	0.52	0.56	0.50	0.33 ^v	...
Warmouth bass	1.13	1.23 ^j	0.93	0.66	0.59	1.47	0.20	0.05 ^v	...
Bullheads	4.99	6.13	25.26	6.62	5.10	5.42	3.90	^{3.51} 3.59	...



Graph 4. Variation in the species composition of the catch, 1938 to 1945.

Yearly catch per acre by species

The largest catch per acre of all species was in 1938 with a catch of 70.8 fish per acre. The lowest catch was in 1940 with a catch of 33 fish per acre. The catch per acre for all species and individual species varied to some extent. More bluegills were taken every year per acre than any other species. For a more detailed tabulation see Table 4.

Fishermen by residence

The residence of the fishermen has been divided into two groups, the nonresident and the resident fishermen. The nonresident are divided into states (Table 8) and the resident into counties (Table 9).

There are 13 states and Windsor represented by the nonresident fishermen. They compose about 46.5 percent of the total number of fishermen; of these only Ohio and Indiana are represented by any number. Ohio fishermen make up 96.9 percent of all nonresident fishermen and Indiana 2.17 percent. All other states combined produced only 0.84 percent. The lake is situated very near the Ohio border and many of the cottages on Bear Lake are owned by people of Ohio.

The resident fishermen are represented by 31 counties and compose 53.5 percent of the total fishermen. The leading 9 counties contribute about 99 percent of the resident fishermen. There were 9,135 resident fishermen. The counties with the most fishermen are listed according to number of fishermen: Hillsdale 73.9 percent, Monroe 12.4 percent, Washtenaw 4.58 percent, Ingham 2.7 percent, Lenawee 1.9 percent, Wayne 1.56 percent, Jackson 1.5 percent, and all the others 1.4 percent. It is interesting to note that about 85 percent of the fishermen are either from Hillsdale County or the State of Ohio.

The first summers work on this experimental lake has been completed. It will be interesting to watch the effects of the experiment on the trend of fishing and whether or not the taking of undersize fish will

Table 8.--Table of nonresident fishermen for Bear Lake 1938 to 1945 inclusive

Year	Ohio	Indiana	Misc. non- resident	Total non- resident fishermen	Percent of total fishermen	Total fishermen
1938	1,113	24	10	1,147	34.30	3,340
1939	1,129	17	18	1,164	43.20	2,695
1940	1,039	19	4	1,062	58.00	1,830
1941	1,354	32	14	1,400	57.00	2,454
1942	903	26	7	936	50.80	1,841
1943	782	5	5	792	45.50	1,740
1944	880	28	9	917	44.90	2,041
1945	509	22	0	531	46.70	1,137
Total	7,709	173	67	7,949	46.50	17,084
Percent of nonresident fishermen by states	96.90	2.17	0.84	...	...	...

Table 9.--Table of resident fishermen by counties for Bear Lake, 1938 to 1945 inclusive

Year	Hillsdale	Monroe	Washtenaw	Ingham	Lenawee	Wayne	Jackson	Misc. resident fishermen	Total resident fishermen	Percent of total fishermen
1938	1,651	268	56	37	97	20	23	41	2,193	65.7
1939	1,138	187	52	51	17	13	59	14	1,531	56.8
1940	489	179	45	21	12	9	9	4	768	42.0
1941	739	153	74	23	15	24	6	20	1,054	43.0
1942	676	134	36	24	2	12	8	13	905	49.2
1943	769	57	45	34	7	28	7	1	948	54.5
1944	820	95	65	49	12	32	21	30	1,124	55.1
1945	474	60	46	7	11	5	2	7	612	53.3
Total	6,756	1,133	419	246	173	143	135	130	9,135	53.5
Percent of fishermen by counties	73.9	12.4	4.58	2.7	1.9	1.56	1.5	1.4	...	...

affect the species population curves. Also whether or not it affects the growth rate, catch per hour, and other factors that make for fishing quality. Data from previous years are sufficient so that accurate comparative studies can be made.

INSTITUTE FOR FISHERIES RESEARCH

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