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REPORT NO. 535

ANALYSIS OF WINTER FISHING ON THREE LAKES OF THE WATERLOO AREA 1938-1939
AND COMPARISONS WITH 1935-36 AND 1936-37 RECORDS

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To intelligently manage and properly administer a body of water to produce maximum yields of game fish, certain basic data must be accumulated. Among these are an adequate physical survey and analysis of the chemical and biological factors present, the sequential accumulation of data relative to fluctuations in yields, cyclic and other changes in species ratios, together with growth rate changes that may occur over a period of years. One method of obtaining these latter data is by a creel census conducted over a sufficient number of years on the same waters to determine the changes that occur. From these surveys it may be possible to evaluate those factors affecting game fish yields which may be manipulated most readily and economically.

The Waterloo Project of the National Parks Service, in 1935, initiated a creel census project in cooperation with the Institute for Fisheries Research of the Michigan Department of Conservation. A similar census was conducted in 1936-37. The census was discontinued the winter of 1937-38, but was resumed for 1938-39.

In 1935-36 data on the winter fishing were obtained from seven lakes within the area. The census for 1936-37 data was taken on ten lakes within

the area.* The census for 1938-39 was limited to three lakes--Clear Lake in Waterloo Township, Jackson County, Portage Lake in Jackson County, and Sugarloaf Lake in Washtenaw County. The 1938-39 census on these three lakes was started January first and continued uninterruptedly until March thirty-first, with the exception of Sugarloaf Lake, the records for which are lacking for the last two weeks of the season.

On these three lakes we have comparable data for the winter fishing for the three year period, and this report will confine itself largely to comparisons and analyses drawn from these data. The records obtained were tabulated and analyzed by the Institute for Fisheries Research.**

COMPARISONS

Weather Conditions

The three winters during which the census was conducted differed decidedly as to weather conditions. The weather of 1935-36 was severe with deep snow throughout most of the census period. Snow accumulated and covered the lakes for a considerable period, resulting in severe winter kill on several of the lakes including a partial loss on Sugarloaf Lake. Efforts were made by the Waterloo Project personnel with the assistance of the Institute for Fisheries Research to minimize the destruction on Sugarloaf Lake. Water was pumped from the lake and then permitted to drain back into the lake through holes cut in the ice. An effect of this partial winter kill was to discourage fishermen, and the result was only a small number of 1935-36 and '37 records for Sugarloaf Lake.

* Report of Eschmeyer.

** See literature cited.

The weather in 1936-37 was exceptionally mild, with little snow and several winter rains. 1938-39 approached a normal winter for this region.

Area of Lake Surface

The approximate areas of the three lake surfaces are:

Clear Lake -- 136.7 acres

Portage Lake -- 480 acres

Sugarloaf Lake -- 204.8 acres

The combined acreage of all three lakes -- 821.5 acres.*

Catch per Acre

Decided fluctuations occur in the catch of legal fish per acre of lake surface. In 1935-36, Clear Lake ranked first with 28.3 fish per acre. Portage Lake ranked second with 2.8 fish per acre; Sugarloaf Lake was third with 0.024--(this latter figure was derived from the records of but 11 fisherman-days, due in all probability to the partial winter kill of that year).

In 1936-37, Clear Lake again ranked first, but with a production of only half the legal fish per acre, as compared with the previous year, averaging 14.2 legal fish per acre. Portage Lake nearly doubled the number of fish per acre compared with that produced the previous year, averaging 5.1 fish per acre. The records for Sugarloaf Lake showed 9 fisherman-days, a figure too small to have much merit, the average being 0.11 fish per acre.

* The areas of Clear Lake and Sugarloaf Lake were obtained by plane table surveys and are quite accurate. Portage Lake acreage was determined from the U.S.G.S. maps and is only approximate.

In 1938-39, Sugarloaf Lake took the lead, with 15.5 legal fish per acre. Clear Lake was second, with 9.1, and Portage Lake third, with 2.4 fish per acre of lake surface.

Considering the three lakes as a unit, the catch per acre of lake surface showed much less variation than did the individual lakes, being for 1935-36 - 6.3; for 1936-37 - 5.4; and for 1938-39 - 6.08.

Average Catch per Hour

The average catch per hour for the three lakes for each year shows no particularly significant change, being 0.8 for 1935-36; 0.9 for 1936-37; and 0.7 for 1938-39, and averaging for the three year period 0.8.

Species

Table 1 shows the fluctuations in the number of fish per fisherman per day by species over the three year period on the three lakes.

Table 1

Number of Fish Per Fisherman Per Day by Species

Species	Clear Lake			Portage Lake			Sugarloaf Lake		
	1936	1937	1939	1936	1937	1939	1936	1937	1939
Black crappie	7.0	2.43	0.46	0.91	1.03	0.26	...	...	0.05
Yellow perch	0.63	1.80	1.55	0.17	0.27	0.13	...	...	0.50
Bluegills	0.05	0.04	0.97	0.12	0.16	0.19	...	...	4.4
Northern pike	0.96	0.11	0.04	0.19	0.30	0.17	...	...	0.08
Rock bass	...	...	...	1.52	1.47	0.97	...	...	...
Sunfish	...	...	...	0.69	0.27	0.09	...	...	0.02
Dogfish	...	...	...	0.06	...	0.13	...	...	...

Average Size of Legal Fish

Records on the average size of the legal fish caught in 1935-36 are not available.

In 1936-37, the average size was 8.6.

The 1938-39 average was 8.3.

Fishing Pressure

The number of fisherman-days recorded for the winter of 1935-36 was 874.

In 1936-37 there were 1,146 fisherman-days recorded.

The record of the number of fisherman-days for 1938-39 was 1,616.

This, over the three year period, indicates a progressive increase in fishing pressure, the 1938-39 figure nearly doubling that for 1935-36. The 1938-39 increase in the records of the three lakes was almost entirely due to the additional fishing on Sugarloaf Lake.

ANALYSIS OF 1938-39 DATA ON THE THREE LAKES

The following figures represent approximately 85% of the winter's fishing on the three lakes.

For the three lakes as a whole, data are available for 1,616 fisherman-days, representing 7,646.25 hours of fishing.

A total of 5,634 fish were caught at the rate of 0.69 fish per hour, each fisherman averaging 4.66 hours per day, and catching an average of 3.4 fish.

Table 2 shows the combined totals for all three lakes:

Table 2

The Combined Totals for the Three Lakes -- 1938-39,
Clear Lake, Portage Lake, and Sugarloaf Lake

Number of fisherman-days:

Male - 1,558
Female - 58
Total - 1,616

Number taking no fish:

Number - 714
Average percentage - 46.3

Total number of hours fished - 7,646.25

Total number legal sized fish caught - 5,634

Catch per hour - 0.69

Catch per fisherman - 3.4

Average size of all fish caught - 8.3

Total number undersized fish caught - 1,327

Average number of hours per fisherman-day - 4.66

Species

Out of 5,634 legal sized fish caught, the combined total from these three lakes, bluegills lead in numbers with a total of 3,275 with an average length of 7.03 inches.

Second were the yellow perch with a total of 1,007 averaging 7.43 inches in length.

Third in numbers were rock bass with a total of 586 with an average length of 8.03 inches.

Fourth were calico bass with 370 and averaging 8.9 inches in length.

Bait

The combined totals of numbers of anglers using their favorite baits and methods show the following order of popularity in use:

Kinnows	-	785
Insects	-	629
Spear	-	151
Wigglers	-	97
Worms	-	25
Pork Rind	-	2
Goldenrod Grub	-	2
Wood Grub	-	1

Residence of Anglers

Fourteen out of every fifteen who fished the three lakes in the winter of 1938-39 were from Jackson and Washtenaw counties. The balance were from nearby counties, as is shown in Table 3, which gives the number of fishermen from each county recorded.

Table 3

Residence of the Fishermen Who Fished Clear, Portage, and Sugarloaf Lakes in the Waterloo Area, Jan.-March, 1939

County	Clear Lake	Portage Lake	Sugarloaf Lake
Jackson	371	525	429
Ingham	2	59	3
Washtenaw	28	2	167
Calhoun	...	1	1
Wayne	...	1	23
Monroe	...	...	1

DATA ON INDIVIDUAL LAKES -- 1938-39

The data below is summarized for each individual lake. For the detailed data by weeks, see the tables in the appendix.

Table 4

Information on Winter Fishing in the Waterloo Area-1939

Three Lakes - Clear, Sugarloaf, and Portage

Data Summarized Total or Average	Clear Lake (Jan. 8-Mar. 25)	Portage Lake (Jan. 15-Mar. 25)	Sugarloaf Lake (Jan. 6-Mar. 11)
Number of fishermen			
Male	388	574	596
Female	13	14	31
Total	401	588	627
Number taking no fish			
Number	167	310	237
Percentage	48	53	38
Total number of hours fished	1,759.25	2,667.5	3,219.5
Total number of legal fish caught	1,250	1,191	3,193
Catch per hour	0.7	0.4	1.0 or 0.99
Catch per fisherman	3.1	2.0	5.1
Average size of all fish caught	7.9	9.3	7.7
Number of undersized fish caught	465	270	592
Average number of hours per fisherman-day	4.4	4.5	5.1

Table 5

Catch by Species

Catch by Species on Three Lakes in the Waterloo Area-Jan.-Mar., 1939

Species	Clear Lake	Portage Lake	Sugarloaf Lake
	(Jan.8-Mar.25)	(Jan.15-Mar.25)	(Jan.1-Mar.11)
Largemouthed Bass-Number	...	...	...
Average Size-Inches	...	...	...
Number Illegal	3	5	...
Bluegills - Number	390	114	2,771
Average Size	6.9	6.7	7.5
Number Illegal	310	75	250
Sunfish - Number	28	55	11
Average size	6.9	6.3	7.9
Number Illegal	2	90	...
Yellow Perch - Number	621	80	306
Average size	8.2	7.2	6.9
Number Illegal	119	32	342
Calico Bass - Number	185	154	31
Average size	7.6	8.8	10.3
Number Illegal	13	2	...
Rock Bass - Number	3	572	11
Average size	8.7	7.2	8.2
Number Illegal	...	63	...
*Pickerel - Number	1	...	...
Average size	18	...	...
Number Illegal	...	...	...
Walleye - Number	...	6	...
Average size	...	20.5	...
Number Illegal	1	...	...
Green Sunfish - Number	...	...	...
Average size	...	...	...
Number Illegal	1	...	...
Northern Pike - Number	19	101	53
Average size	23.1	19.2	20.2
Number Illegal	4	2	...
Dogfish - Number	1	77	...
Average size	24.0	17.7	...
Number Illegal	...	...	...
Suckers - Number	1	21	...
Average size	18.0	15.0	...
Number Illegal	...	...	...
Bullheads - Number	1	1	7
Average size	10.0	6.0	9.7
Number Illegal	...	...	...
Gar Pike - Number	...	5	3
Average size	...	24.2	30.0
Number Illegal	...	...	...
Carp - Number	...	5	...
Average size	...	13.0	...
Number Illegal	...	...	...
*Smallmouthed Bass - Number	...	...	...
Average size	...	...	...
Number Illegal	12	1	...

* Identification uncertain.

Bait

Bait Used and Number of Anglers Using Each Bait on Three Lakes
in the Waterloo Area - January-March, 1939

Table 6

Bait	Clear Lake	Portage Lake	Sugarloaf Lake
	(Jan.3-Mar.25)	(Jan15-Mar.25)	(Jan.1-Mar.11)
Number of Anglers Using Each Bait			
Worms	8	9	8
Minnows	297	255	233
Insects	266	34	329
Wigglers	2	6	89
Pork rind	...	...	2
Wood grub	...	...	1
Goldenrod grubs	...	...	2
Spear	13	122	16
Unknown	24	187	9
Grand total	610	613	689

On Clear Lake more fishermen used minnows than any other type of bait, 49%; 45% used worms and insects; 2% used the spear; for 4% no records are available . On Portage Lake 41% used minnows; 9% used worms and insects; 20% used the spear; 30% being unknown. Sugarloaf Lake fishermen, 33%, used minnows; 61% used worms and insects; 2% the spear; and there are no records for 4%.

Sugarloaf Lake shows the greatest percentage of fishermen using worms and insects, 61%, and produced the greatest catch of bluegills. Portage Lake shows the least number using worms and insects, and produced the least number of bluegills in the catch. Clear Lake was intermediate.

Clear Lake

Clear Lake ranked second in the number of legal fish taken with a total of 1,250, at the rate of 0.7 fish per hour. The records show 401 fisherman-days, with a catch of 3.1 fish per fisherman per day.

Species

The most outstanding fact resulting from the 1935-36 census was the high proportion of black crappies taken from Clear Lake, their number being 3,493 out of the 3,881 fish taken, or 90% of the total fish take. At this time 8% of the catch were yellow perch.

The following year, 1936-37, 55% of the total catch were black crappies and 41% yellow perch.

The winter of 1937-38 no census was taken, but the census was resumed in 1938-39, at which time black crappies dropped to third place, the number caught being 185, representing 14.9% of the total catch. Yellow perch rose to first place with a total of 621 legal fish caught, or 49.7% of the total catch.

Bluegills occupied the fourth place in 1935-36, the number recorded being 25 or 0.64% of the total catch of legal fish.

In 1936-37 the number of bluegills recorded was 18 or 0.92% of the total catch.

In 1938-39 the bluegills made a considerable gain, taking second place on the list with 390 caught, representing 33.1% of the total take.

Portage Lake

Portage Lake in Jackson County, ranked third in 1938-39 with a total of 1,191 legal fish caught at the rate of 0.4 per hour. The records show 588 fisherman-days with a catch of 2.0 fish per fisherman per day.

Portage Lake shows the least change for the three census periods, rock bass leading for all three years, numbering 552 or 41.6% of the total catch in 1935-36; 1,023 or 41.6% in 1936-37; and 572 or 48.07% in 1938-39.

Black crappies hold second place for 1938-39 but are less numerous, being 154 or 12.9% for 1939 as against 330 or 24.4% for 1935-36, and 715 or 28.8% for 1936-37.

Sugarloaf Lake

Records for Sugarloaf Lake were so few for 1935-36 and '37 that comparisons with the 1938-39 census would be of little value.

In the winter of 1938-39 the records for Sugarloaf Lake showed a decided increase in the number of fisherman-days and the legal fish taken, placing this lake in first place in the number of legal fish taken, with a total of 3,193 at the rate of 1.0 fish per hour. The records show 627 fisherman-days showing an average catch of 5.1 fish per fisherman-day.

Bluegills ranked first with 2,771 or 86% of the total legal catch. Yellow perch ranked second with 306 or 9.5% of the total legal catch.

SUMMARY

Population Fluctuations

The accumulated data indicate that the fish populations in any particular lake may vary from year to year. A species of fish may be dominant one year and relatively insignificant in the catch of another year. Insufficient data are at hand to explain satisfactorily, the causative factors of this possibly cyclic variation. The phenomenon is significant in that it may have a direct bearing on management practices.

A particularly large change occurred in the numbers of black crappies taken at Clear Lake, the reduction in catch per hour for the winter of 1939 on Clear Lake being largely due to the lack of black crappies appearing in the catch. Approximately 100 less fisherman-days were recorded in 1939 than in 1936.

This wide fluctuation in the population of black crappies in Clear Lake corresponds with similar conditions found by Dr. Juday and others in Wisconsin.*

Baits

It was suggested from several sources that a contributing cause of the small number of black crappies taken from Clear Lake in 1938-39 as compared with the number taken in 1935-36, was the change in the kind of bait used; that fishermen were adopting the baits and methods that had proved successful on the bluegill lakes in the southern portion of the state.

On Craig Lake in Branch County, the winter of 1938-39, 91% of the total catch was bluegills. Two thousand seven hundred seventy-one of the total number of 2,888 fishermen used worms and insects as bait, whereas only 107 out of that total number of fishermen used minnows.

On Clear Lake, for the winter of 1938-39, 31% of the total catch of legal fish was bluegills. Forty-five per cent of the total number of fishermen used worms and insects, and 40% of the total number of fishermen used minnows.

From these figures it is indicated that had the population of black crappies in 1938-39 been as high as it was in 1935-36, and had the effectiveness of the various baits used been a constant, the total catch of black crappies should have been much greater than it was, in 1938-39, for the winter season.

Fish Production

Sugarloaf Lake: In 1939 production on Sugarloaf Lake as indicated by the catch per hour was the highest of the three lakes censused. This indicates definite come back after the partial winter kill of 1936. This was definitely the best bluegill lake in 1938-39, producing 2,771 bluegills. Yellow perch ran second with 306. Fishing was so small over the two previous

* See Literature Cited.

census periods that comparisons are not warranted.

Clear Lake: On Clear Lake a large drop in the number of black crappie taken has occurred. This was a progressive change, the production being highest in 1935-36, a significant drop in 1936-37, and only 185 black crappies caught in 1938-39. Yellow perch reached the highest point during the winter of 1936-37, the lowest period being 1935-36. Bluegills showed a definite increase in 1938-39, being 25 in 1935-36, 18 in 1936-37, and 390 in 1938-39. Northern pike showed a reduction from a high of 53 in 1936-37 to a low of 19 in 1938-39.

Portage Lake: Rock bass remained dominant in the catch for the three year period, being highest in 1936-37 with 1,023, and dropping to 572 in 1938-39, this latter figure being almost the same as that for 1935-36. Black crappies are also highest in 1936-37, and lowest in 1938-39, being 715 and 754 respectively. Sunfish showed a progressive drop for the three year period of the census--250 in 1935-36, 188 in 1936-37, and 55 in 1938-39. All other species showed a decline in 1938-39.

Fishing Pressures

The fishing pressure on the different lakes showed definite tendencies to shift. Mill and Mud Lakes, not among those lakes censused in 1938-39, had many more fishermen in 1939 than in 1936. However, Mud Lake suffered a heavy loss in the winter of 1936, accounting in great part for its few fishermen that year.

Sugarloaf Lake showed the greatest change in fishing pressure for the three year period. The first two censuses 1935-36 and 1936-37, showed a negligible number of anglers, and in 1938-39 this lake was the heaviest fished of the three, numbering 627 in this last census.

Clear Lake in 1935-36 was fished by 499 fishermen, in 1936-37 by 444, and in 1938-39 by 401. This shows relatively little change in fishing pressure.

Portage Lake in 1935-36 showed 364 fishermen; 1936-37 showed 693 fishermen, and in 1938-39 there were 588 fishermen, indicating change, but not of sufficient significance to warrant drawing conclusions on fishing pressures.

Effect of Winter Fishing on Summer Fishing

The average yield for the three lakes for the 1938-39 season was 6.08 per acre of lake surface. On the basis of the estimate from winter kill of 500 legal sized fish per acre, this is believed to represent less than 1% of the fish available to the fishermen.

From this figure it reasonably can be assumed that winter fishing on these lakes does not affect materially the number of fish available to the summer fisherman. This conclusion coincides with the findings of Hazzard and Eschmeyer.*

With the exception of Sugarloaf Lake, species taken during the winter ice fishing period are principally, with the possible exception of the sunfish, highly predacious fish, and are known to consume large numbers of young bluegills.

The total winter catch on the three lakes for the winter of 1938-39 was 5,634. This, compared with the summer catch for 1935-36 on these same lakes of 19,484, indicates that the winter take was approximately 23% of that for the summer. (It is to be hoped that a census may be conducted for the summer of 1939 which will make available data for direct comparison.)

Best Fishing

In the winter of 1935-36, the best fishing of the three lakes was on Clear Lake.

The best fishing in 1936-37 was on Portage Lake.

Sugarloaf Lake offered the best fishing in 1938-39.

* See Literature Cited.

Continuity in Records

The three censuses suggest the value of continuous records over a number of years on the same waters, as a determinant of population fluctuations, to ascertain fishing pressures, and to establish the normal yield for these waters.

ACKNOWLEDGMENTS

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INSTITUTE FOR FISHERIES RESEARCH

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APPENDIX TO REPORT ON GENERAL CREEL CENSUS

1937

DATA LISTED BY COUNTIES

Some of the data listed
by counties are obviously
not reliable because of the
small number of returns.

TABLE I

General Data from Creel Census

On Sugarloaf Lake, Washtenaw County, Winter 1938-39

Date	No. of Fishermen			No. of fish- ermen taking no fish		Total No. of hours fished	Total No. of legal- sized fish caught	Catch per hour	Catch per fisherman	Ave. size of all fish caught	No. under- sized fish caught	Ave. No. of hours per fisherman- day
	Male	Female	Total	No.	%							
Jan. 1-7	7	..	7	7	100	16.00	...	...	...	...	...	2.3
Jan. 8-14	2	..	2	1	50	8.25	1	0.1	0.5	18.0	...	4.1
Jan. 15-21	25	5	30	17	57	179.50	45	0.3	1.5	10.3	5	6.0
Jan. 22-28	44	5	49	32	65	266.25	42	0.2	0.9	11.8	55	5.4
Jan. 29-Feb. 4	38	3	41	26	63	254.25	48	0.2	1.2	8.6	51	6.2
Feb. 5-11	38	4	42	33	79	237.75	35	0.1	0.8	9.8	12	5.7
Feb. 12-18	88	5	93	32	34	498.25	691	1.4	7.4	7.8	50	5.4
Feb. 19-25	63	1	64	18	28	334.75	337	1.0	5.3	7.7	11	5.2
Feb. 26-Mar. 4	134	1	135	26	19	703.25	1,196	1.7	8.9	7.4	206	5.2
Mar. 5-11	157	7	164	45	27	721.25	798	1.1	4.9	7.5	202	4.4
Total or Average	596	31	627	237	38	3,219.50	3,193	1.0 or 0.99	5.1	7.7	592	5.1

Sugarloaf Lake - 1939

Number of Each Species, Average Size, and Number of Illegal Fish

Date	Bluegills			Sunfish			Yellow Perch			Calico Bass			Bullheads			N. Pike			Gar Pike			Rock Bass			
	No.	Ave. size	No. illegal	No.	Ave. size	No. illegal	No.	Ave. size	No. illegal	No.	Ave. size	No. illegal	No.	Ave. size	No. illegal	No.	Ave. size	No. illegal	No.	Ave. size	No. illegal	No.	Ave. size	No. illegal	
Jan. 1-7																									
Jan. 8-14																1	18.0								
Jan. 15-21	21	7.9					15	7.1	5						9	21.0									
Jan. 22-28	10	8.2	10				19	6.5	45						10	20.2		3	30.0						
Jan. 29-Feb. 4							42	6.9	51				1	12.0	5	22.2									
Feb. 5-11	1	8.5	4				27	7.6	8						7	18.6									
Feb. 12-18	558	7.8	12	5	8.3		112	6.6	38	5	11.6		1	12.0	9	20.4					1	8.5			
Feb. 19-25	322	7.4	11				7	7.9							8	19.6									
Feb. 26-Mar. 4	1,112	7.4	118	4	7.5		54	7.1	88	16	9.7		1	10.0	1	21.0					8	7.9			
Mar. 5-11	747	7.4	95	2	7.9		30	6.9	107	10	10.7		4	8.5	3	19.3					2	9.0			
Total and Average Size	2,771	7.5	250	11	7.9		306	6.9	342	31	10.3		7	9.7	53	20.2		3	30.0		11	8.2			

Sugarloaf Lake - 1939

Number of Anglers Using Each Bait

Date	Worms	Minnows	Insects	Spear	Pork rind	Wigglers	Wood grub	Goldenrod grubs	Unknown
Jan. 1-7		7				7			
Jan. 8-14		2							
Jan. 15-21	3	24		3		3			1
Jan. 22-28		38		2		12			2
Jan. 29-Feb. 4		36	4	1		5			
Feb. 5-11		31	2	6		3			2
Feb. 12-18		37	22	4		42			
Feb. 19-25	1	13	36		2	17			
Feb. 26-Mar. 4	2	23	124				1		
Mar. 5-11	2	22	141					2	4
Total	8	233	329	16	2	89	1	2	9

Residence of Fishermen

Date	Jackson County	Ingham County	Gladwin County	Washtenaw County	Wayne County	Calhoun County	Monroe County	Unknown	Total
Jan. 1-7	5				2				7
Jan. 8-14				1	1				2
Jan. 15-21	7			20	3				30
Jan. 22-28	30			17				2	49
Jan. 29-Feb. 4	13	1		19	3				41
Feb. 5-11	10		1	28	3				42
Feb. 12-18	58	1		26	8				93
Feb. 19-25	55			9					64
Feb. 26-Mar. 4	110			23	1	1			135
Mar. 5-11	136	1		24	2		1		164
Total	429	3	1	167	23	1	1	2	627

TABLE II

General Data from Creel Census

On Portage Lake, Jackson County, Winter 1938-39

Date	No. of Fishermen			No. of fish- ermen taking no fish		Total No. of hours fished	Total No. of legal- sized fish caught	Catch per hour	Catch per fisherman	Ave. size of all fish caught	No. under- sized fish caught	Ave. No. of hours per fisherman- day
	Male	Female	Total	No.	%							
Jan. 15-21	24	..	24	14	58	98.75	48	0.5	2.0	7.4	43	4.1
Jan. 22-28	78	2	80	44	55	373.25	124	0.3	1.6	10.0	82	4.7
Jan. 29-Feb. 4	103	1	104	64	62	490.75	112	0.2	1.1	10.8	44	4.7
Feb. 5-11	127	4	131	72	55	601.00	210	0.3	1.6	9.9	25	4.6
Feb. 12-18	110	4	114	51	45	519.25	357	0.7	3.1	9.3	53	4.6
Feb. 19-25	43	..	43	24	56	179.75	106	0.6	2.5	8.3	12	4.2
Feb. 26-Mar. 4	64	2	66	26	39	255.75	184	0.7	2.8	8.1	11	3.9
Mar. 5-11	21	1	22	13	59	118.00	48	0.4	2.2	9.1	..	5.4
Mar. 12-18	2	..	2	1	50	17.00	1	0.06	0.5	17.0	..	8.5
Mar. 19-25	2	..	2	1	50	14.00	1	0.07	0.5	19.0	..	7.0
Total or Average	574	14	588	310	53	2,667.50	1,191	0.4	2.0	9.3	270	4.5

Portage Lake - 1939

Number of Anglers Using Each Bait

Date	Worms	Insects	Minnows	Spear	Wiggler	Unknown
Jan. 15-21	1	8	18	2		
Jan. 22-28	5	7	19	26	1	29
Jan. 29-Feb. 4	2	9	15	26		59
Feb. 5-11	1	4	38	24	1	67
Feb. 12-18		3	65	21	1	26
Feb. 19-25			22	12	3	6
Feb. 26-Mar. 4		3	52	11		
Mar. 5-11			22			
Mar. 12-18			2			
Mar. 19-25			2			
Total	9	34	255	122	6	187

Residence of Fishermen

Date	Jackson County	Ingham County	Calhoun County	Washtenaw County	Wayne County	Total
Jan. 15-21	24					24
Jan. 22-28	71	9				80
Jan. 29-Feb. 4	87	16	1			104
Feb. 5-11	115	14		1	1	131
Feb. 12-18	104	9		1		114
Feb. 19-25	35	8				43
Feb. 26-Mar. 4	63	3				66
Mar. 5-11	22					22
Mar. 12-18	2					2
Mar. 19-25	2					2
Total	525	59	1	2	1	588

Jan. 21 - One not contacted.

TABLE III

General Data from Creel Census

On Clear Lake, Jackson County, Winter 1938-39

Date	No. of Fishermen			No. of fish-ermen taking no fish		Total No. of hours fished	Total No. of legal-sized fish caught	Catch per hour	Catch per fisherman	Ave. size of all fish caught	No. under-sized fish caught	Ave. No. of hours per fisherman-day
	Male	Female	Total	No.	%							
Jan. 8-14	1	..	1	...	..	3.00	4	1.3	4.0	7.0	...	3.0
Jan. 15-21	34	..	34	20	59	111.50	65	0.6	1.9	7.4	13	3.3
Jan. 22-28	54	..	54	22	41	219.25	135	0.6	2.5	8.4	4	4.1
Jan. 29-Feb. 4	53	1	54	22	41	250.00	221	0.9	4.1	8.1	71	4.6
Feb. 5-11	61	4	65	19	29	304.25	259	0.9	4.0	8.1	81	4.7
Feb. 12-18	73	3	76	33	43	367.75	224	0.6	2.9	7.9	91	4.8
Feb. 19-25	44	3	47	13	28	225.00	186	0.8	4.0	7.8	105	4.8
Feb. 26-Mar. 4	26	2	28	13	46	147.00	70	0.5	2.5	7.4	50	5.3
Mar. 5-11	19	0	19	7	37	69.25	59	0.9	3.1	7.3	47	3.6
Mar. 12-18	11	0	11	8	73	37.75	21	0.6	1.9	7.1	0	3.4
Mar. 19-25	12	0	12	10	83	24.50	6	0.2	0.5	7.5	3	2.0
Total or Average	388	13	401	167	42	1,759.25	1,250	0.7	3.1	7.9	465	4.4

Clear Lake - 1939

Number of Each Species, Average Size, and Number of Illegal Fish

Date	S. M. & L. M. Bass		Bluegills		Sunfish		Yellow Perch		Calico Bass		Rock Bass		Pickerel		Walleye		Green Sunfish		N. Pike		Dogfish		Suckers		Bullheads			
	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.		
	No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal		No. size illegal			
Jan. 8-14							1	7.0		3	7.0			1	18.0													
Jan. 15-21			26	7.1	6		1	23	7.7	3	14	6.7	1		1	8.0												
Jan. 22-28			2	7.0			1	115	7.9	3	13	7.5																
Jan. 29-Feb. 4			41	7.0	40			171	8.3	30	8	7.7							4	22.3		1	24.0					
Feb. 5-11			71	6.9	64			140	8.5	12	43	7.3	3						1	28.0	1							
Feb. 12-18	S.M. bass	12	69	7.1	51	21	7.0	89	8.1	21	40	7.9	6						3	26.0	2					1	10.0	
Feb. 19-25	L.M. bass	1	88	6.9	52			42	7.3	49	50	7.5	3						4	19.5	1				1	18.0		
Feb. 26-Mar. 4			38	6.7	50	3	6.7	16	8.1		11	7.6							6	24.0								
Mar. 5-11		2	43	7.0	44	2	6.5	12	8.4	1	2	8.0							1	22.0								
Mar. 12-18			12	6.8				8	7.3		1	9.0																
Mar. 19-25					3	2	6.5	4	8.0																			
Total or Average	L.M. bass	3	390	6.9	310	28	6.9	2	621	8.2	119	185	7.6	13	3	8.7			1	18.0						1	18.0	
	S.M. bass	12																	1	19	23.1	4	1	24.0		1	18.0	

Clear Lake - 1939

Number of Anglers Using Each Bait

Date	Worms	Minnows	Insects	Wigglers	Spear	Unknown
Jan. 8-14		1				
Jan. 15-21	3	27	22			
Jan. 22-28	2	51	22		1	
Jan. 29-Feb. 4		39	37		10	
Feb. 5-11		53	44		2	
Feb. 12-18		44	71			4
Feb. 19-25		31	31			13
Feb. 26-Mar. 4	1	18	18			6
Mar. 5-11		17	14			
Mar. 12-18		9		2		
Mar. 19-25	2	7	7			1
Total or Average	8	297	266	2	13	24

Residence of Fishermen

Date	Jackson County	Ingham County	Washtenaw County	Total
Jan. 8-14	1			1
Jan. 15-21	30		4	34
Jan. 22-28	50		4	54
Jan. 29-Feb. 4	54			54
Feb. 5-11	65			65
Feb. 12-18	68		8	76
Feb. 19-25	41	2	4	47
Feb. 26-Mar. 4	26		2	28
Mar. 5-11	17		2	19
Mar. 12-18	10		1	11
Mar. 19-25	9		3	12
Total	371	2	28	401

No fishermen on lake Mar. 6 - 7 - 16.

TOTAL CATCH OF FISH BY SPECIES

