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A STUDY OF THE TREND OF FISHING IN HOUGHTON LAKE

1928 - 1946

By

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Abstract

A study was made of creel census data taken by Conservation Officer Thomas White and covering the period of 1928 through 1946, on Houghton Lake, Michigan's largest.

The trend of fishing over the period was illustrated from figures for average catch per hour, and species composition of the catch. Trend was examined under the headings: summer fishing, winter line fishing, and winter spear fishing.

The trend in catch per hour was found to be related somewhat to change in the species composition of the catch for summer fishing especially. Catch per hour, species composition, and other factors were found to differ widely for summer, winter line, and winter spear fishing.

Pike were formerly predominant in the catch which is at present made up largely of panfish. Fishing is now fair in summer and good in winter, the latter being influenced by the increase of bluegills in the catch.

The apparent decline of the proportion of pike in the total catch through the years does no more than indicate a possible reduction of the pike population of the lake (although it is claimed by residents that fewer pike are actually being caught now). Although the data presents no actual check, change of fishing methods from pike to panfish fishing would seem to be a factor.

Introduction

During the short history of fish management in this country, most creel census work covering any lengthy period of time has been the work of several or many men. Any figures derived from the original census data

taken by these individuals must necessarily have included errors due to their varying methods and abilities. For example, if one of five creel census clerks is so interested in pike fishing that he favors pike fishermen while sampling, the final figures are very apt to give an untrue picture of the percentage of pike in the total catch. If an impartial clerk takes his place during the following season, the final figures will be more correct and will show a decline in pike fishing. Mathematically, the figures for the two seasons could not be comparable.

This study of Houghton Lake is unique, in that it is based on one man's activities, covering a 19-year period extending from 1928 through 1946. The author of the original creel census data is Mr. Thomas White, recently retired conservation officer of the Michigan Department of Conservation. Some summer figures are available for all the years other than 1936.

The study is incomplete in various respects. There is no record of winter fishing for the 1928-29, 1929-30 and the 1935-36, 1936-37 seasons. (The CCC data for the winter seasons of 1935-36 and 1936-37 have been plotted in Figures 1, 4 and 5 for the sake of completeness.) (Eschmeyer, 1936--Reports 368 and 417.) Some of the data cover a period of 19 years. Others are available for shorter periods or for one year only. Some of this incompleteness is due to changes in creel census technique involving new forms which called for different data from year to year, and to the loss of almost all of the original census records.

Summer and winter fishing were examined separately because of inherent differences in fishing methods, species sought, and catch per hour. In regard to each, there has been an attempted illustration of

the trend of fishing. The trend is, in this instance, illustrated by use of figures representing average catch per hour, and percentages of particular species in the total catch. Factors possibly affecting these figures are discussed.

It should be understood that there has been no attempt to actually evaluate the species composition of the fish population in the lake.

The data merely lends itself to a comparison of yearly and monthly catch per hour and percentage figures, changes in which cannot be clearly evaluated.

General Information

Houghton Lake is Michigan's largest, although many lakes in other states are of greater size. Its largest dimensions are approximately 9.5 x 5.5 miles, enclosing an area of 31.3 square miles, or 20,044 acres. The greatest depth does not exceed 20 feet, and most of the lake is a good deal less. As a result, the lake probably never stratifies in summer thus assuring a plentiful supply of oxygen in all waters, as a direct result of continued overturn when free of ice.

The lake is located in Roscommon County, almost directly in the center of the northern half of Michigan's lower peninsula. Its outlet is the Muskegon River which flows into Lake Michigan. The surrounding area was, until recent years, drained by seven tributaries and numerous drainage ditches. Most of the latter now are either cut off from the lake, or filled in on the lake shore by grading for the purposes of cottage and highway building.

In the late 20's and early 30's, the lake was said to be one of the finest pike fishing grounds in Michigan, and now offers fair fishing

for other species (possibly due to a change in fishing methods) to thousands of people, both resident and non-resident. Many of the residents depend upon the tourist trade for a sizable portion of their yearly incomes, and much of the shoreline and in places for some distance back is now built up with cottages and resorts.

The value of a lake of this type is obviously great, and for this reason, the Michigan Conservation Department has endeavored to watch closely the quality of fishing. Mr. White's records are an aid in determining the value of the fishing, and in direct proportion, the value of the lake itself. This is not meant to infer that other factors do not, separately or when taken together, exert as great an influence concerning the value of the lake to the people of the state.

Both residents and non-residents state that fishing, in general, is fair to good, and this contention is borne out by the 1948 netting activities which indicated a population of large and fast-growing panfish, walleyes and bass.

During the 19 year period covered, Tom White obtained data (almost all of the interviews were partial--that is, taken on the lake before the anglers had completed their trips) from over 60,000 anglers who fished over 172,000 hours and caught over 106,000 fish.

Mr. White stated during an interview with the writer that he covered perhaps 2 percent of the fishermen. Assuming this to be the case (and allowing for a large percentage of error in the estimate), approximately three million fishermen caught 5,300,000 fish in 8,600,000 hours of fishing, during the period extending from 1928 through 1946.

If the figures are close to being correct, they reveal an astounding amount of fishing and fish production for an inland lake.

Natural resources pay off in dollars and cents in the final run, and should be maintained where possible. Since fish fall in the category of natural resources, the Michigan Department of Conservation should make every endeavor to maintain good fishing in this lake.

Collection of Data

Mr. White collected the data by starting at either end of the lake and working toward the other end, while attempting to take a random sample of fishermen contacted. The sampling usually occupied whole half days, either morning or afternoon. Weekends were more heavily sampled than were week days, but any error resulting would be constant throughout the period.

The census slips were forwarded to the Institute for Fisheries Research, where the data were transferred to summary cards to facilitate filing and storage. All but the 1946 set of census slips were destroyed, and the data for these years were taken directly from the summary cards, thus including any undetectable mistakes made in transfer. The 1946 data were taken directly from the census slips, and contain more information than was present on the summary cards for previous years.

Certain data were thrown out. Some few, by other creel census clerks, were not considered because it was felt that differences in their sampling techniques would introduce an error. Data actually selected contained factors which were related, and which were available for enough years to allow a comparison. For example, figures for number of fishermen, number

of hours fished, and species and number of fish caught, were available for summer fishing from 1928 through 1946, excluding 1936. The few individual interviews which contained only three of the above four factors were discarded.

Not all the data in the tables are empirical. For example, figures were not available for the number of fishermen censused during 1928 and 1929. These were calculated by direct proportion from the number of hours fished during those years, and from the number of anglers censused and the number of hours fished in certain succeeding years. The calculations were for the sake of completeness, and have been indicated as such in the tables.

Consideration of Data

The trend of fishing was examined under three major headings of summer fishing, winter line fishing, and winter spear fishing, separated because of the differences among them such as method of fishing, species sought after, and catch per hour.

Under each major heading, trend of fishing was examined by comparison of yearly and monthly totals. The total yearly figures are, of course, prejudiced by the presence or absence of sampling figures for certain months. They present an over-all picture of fishing on the lake, but do not reveal the incompleteness of sampling during specific years. Examination of monthly data reveal a deficit of monthly figures for particular years, and present a comparison of figures within each month from year to year.

The 1946 data, (not available for former years), such as number of male, female, resident and non-resident anglers, are presented merely as interesting figures.

The Houghton Lake creel census data are considered quite representative for the following reasons. First, one individual collected the data during the 19 year period, and his method of collecting probably did not change greatly during that time. Secondly, there is no evidence of bias which caused censusing of particular classes of anglers; the records were not selected from anglers who used a particular method or who fished for a particular species.

The differences exhibited in angling results in the 19 year period were not subjected to statistical analysis because of lack of time. It must be kept in mind that the summary is a sample of data, and not for total fishing. Consequently, the data probably contain considerable variation, although the calculated average values are assumed to be representative.

Totals for Summer, Winter Line and Winter Spear Fishing

Of 60,783 individual interviews, summer anglers accounted for 47,315, winter line anglers for 11,668, and winter spear fishermen for a low 1,800.

Summer fishermen are better represented for three reasons.

1. More people fish during the summer.
2. Summer records were available for all years but 1936, whereas winter records were lacking altogether for several seasons.
3. Winter spearing was prohibited by a special act of the legislature as of 1940.
4. Number of ice lines were reduced from 5 to 2 in 1936.

These figures do not represent a constant percentage of the anglers actually on the lake since Mr. White stated that he interviewed a larger percentage of winter than he did of summer fishermen.

Summer fishermen spent less time fishing per fisherman than did winter anglers. At the same time, they were less successful in catch per hour than winter line fishermen, and more successful than were the spear fishermen. The latter's low catch per hour of 0.27 fish would seem to indicate poor fishing if it were not for the fact that almost 98 percent of the fish speared were pike. Summer fishermen with a catch per hour of 0.54 took home a total catch of which pike made up less than 29 percent. Pike constituted less than 8 percent of the catch of the winter line anglers whose catch per hour was 0.84.

In accounting for the poor showing of the spear fisherman, it must be remembered that only one spear can be handled at a time, whereas a line fisherman can efficiently use as many lines as are legally permitted. It is also generally true that catch per hour and size of fish caught are inversely correlated. Line anglers are, depending upon bait used and method of angling, able to capture fish of a greater size range than can spear fishermen who must seek only the larger fish. Spearmen were also restricted by law to the taking of only pike and rough fish.

The Trend of Fishing as Revealed by Average Catch Per Hour

Catch per hour figures for the three major types of fishing follow somewhat the same trend through the years, as is clearly illustrated by Figure 1. The factors influencing each are not necessarily the same, although they are probably closely related to each other. Catch per hour

for spear fishermen remained low and fluctuated little during the seven seasons of sampling. That of the winter line anglers fluctuated considerably, but in general followed the trend of summer fishing.

Some of these fluctuations seem to correlate with other factors which will be considered later. Catch per hour of the summer anglers followed a definite trend through the years. It was low during the early years of the census, reached a peak, and again became low in the last years, with some improvement in 1946.

When the data for summer fishing was broken down to monthly averages, it was found that August offered the best catch per hour with July, September, and May and June (identical) following in that order. It should be noted that pike made up almost one third of the total catch during the latter two months, while accounting for less than 10 percent of the fish caught during July, August, and September.

It has been suggested that pike are harder to catch during the warmer months of the year because food production is at its peak at that time. Pike are also thought to inhabit cooler waters, when available, during the hotter months, whereas rock bass, sunfish and bluegills often inhabit the shoal areas during this period, enabling the angler to hook them with greater ease.

Generally speaking, although the average catch per hour differed among the months, the trend of each month followed that of total summer fishing, being low during early years, high during middle years, and again low during the late years of the census. This would seem to indicate that fishing quality, when measured as a yearly trend, is altered by factors other than time of year, at least for summer fishing.

An examination of monthly data for winter line fishing shows that December produced the best fishing, with January, March and February following in that order (Table 5). The figures for December were, however, taken mostly from one season's census, and are not a basis for an adequate census. March censusing was also light, the number of anglers and years censused being inadequate. According to Mr. White, most of the time during these months was spent in carrying out other duties. Ice is often unsafe in December and March which may also account for the few records taken then.

Because winter data were less complete than might be desired, it is not possible to say that the monthly catch per hour trends do or do not individually follow the trend of the average winter figures. During certain periods, both January and February vaguely follow the winter averages, but this may be due to chance, since one or the other of both months was inadequately sampled during certain years.

December and March spear data are also incomplete, each represented by the sampling of one year only (spearing allowed during these months only during years 1930-33, and then only when lake was frozen over.). Both January and February spearing data are represented by the same seven years, although during most of these years inadequate numbers of anglers were censused. However, although it cannot be stated that monthly spearing trends follow similar patterns they all, nevertheless, show a low catch per hour commensurate with an almost total catch of northern pike.

Catch Per Hour as Related to Species Composition of the Total Catch

Trend of fishing on Houghton Lake during the 1928-46 period under consideration, as represented by catch per hour figures, seems to be

somewhat tied up with variation in species composition of the catch (Figs. 2-5). Possibly because they are more complete, summer data illustrate this more clearly.

During the summer seasons of 1928 through 1931, fishermen experienced a low catch per hour. Of the total catch pike constituted a large percentage. From 1932 through 1937, the catch per hour rose steadily while the percentage of northern pike in the total catch continued to drop. At the same time, the percentage of panfish in the total catch showed a steady increase. This, of course, strengthens the theory that catch per hour and size of fish caught, are inversely correlated.

After reaching its peak in the summer of 1937, the catch per hour dropped steadily with minor fluctuations, up to 1946. Percentage of pike and walleyes in the total catch remained low, while panfish maintained their high level.

Catch per hour for winter line fishing tends to be a little more confusing. As during the summer, the percentage of pike in the total catch dropped to an extreme low in 1937, and remained there until the end of the census. From 1930 through 1935, pike accounted for at least one third of each winter's catch, showing little correlation with catch per hour during that period. At the same time, however, perch caught at the same locations in the lake were abundant, and accounted for almost all of the panfish catch. Pike were probably caught less during the winter, because perch were readily available to pike fishermen, with the result that neither can be closely tied to catch per hour during the early years.

During the winter seasons of 1937-38, and 1938-39, catch per hour rose to a peak; panfish suddenly accounted for almost all of the catch, while the percentage of perch when taken alone and of pike remained low. From then until 1946, catch per hour became low, rose, and became low again, its trend being followed roughly by the percentage of panfish in the total catch, and by the percentage of bluegills in the total catch.

It should be noted that the CCC catch per hour figures for winter line fishing during the 1935-36 and 1936-37 seasons follow the trend established during preceding and succeeding years, jumping from about .2 fish per hour to 1.2 fish per hour in one season's time. During these two seasons, perch made up the greater part of the panfish catch, and the percentage of pike continued to decline. According to the CCC census, perch made up about 90 percent of the total catch during the 1936-37 winter season. The data for the 1937-38 season (Mr. White's) showed that perch made up less than 10 percent of the catch during that season, while bluegills became the most abundant fish in the catch.

This rapid change in composition of the catch suggests that fishermen changed to bluegill fishing not only because they were obviously abundant, but also because pike fishing had fallen off to the extent that it was no longer profitable to fish for them. If it is also assumed that composition of the catch reflects changes in the fish population, bluegills must have suddenly increased while perch underwent a rapid decline in numbers.

Planting of Perch and Walleyes

During the period extending from 1933 to 1944, millions of walleyes and thousands of perch were planted in Houghton Lake.

Year	Number of Walleye (Fry)	Number of Perch (6-9 months)
1933	1,800,000	30,000
1934	2,100,000	30,000
1935	1,800,000	60,000
1936	2,000,000	30,000
1937	2,000,000	30,000
1938	2,000,000	40,000
1939	2,200,000	...
1940	4,000,000	...
1941	...	25,000
1942	2,000,000	...
1943	4,160,000	...
1944	<u>4,000,000</u>	<u>...</u>
Total	28,060,000	245,000

Assuming that both the perch and walleyes in this lake reach legal size in from 4 to 5 years, any benefit derived from the above planting should have been apparent in the data from 1937 or 1938 on. That little was derived is evident. Before 1937, perch made up as much as 90 percent of the catch during certain winter seasons, and after that year averaged less than 10 percent. Percentage of perch taken during the summer also dropped after 1937. Actually, fewer perch were taken in both summer and winter during the years following 1937. Although walleyes made up a slightly greater percentage of the total catch after 1937, during the summer, the difference was so slight and so irregular from season to season that no correlation could be found between seasonal increases or decreases and the corresponding plantings 4 to 5 years before. Actually the number of walleyes taken from year to year during this period was approximately equal to that taken before. In some years they were present in small numbers and in others were almost absent.

It should also be noted that catch per hour dropped in the late 30's and early 40's in spite of the plantings.

From 1928-46 both perch and walleyes fluctuated in the catch from year to year--which may be attributed much more plausibly to natural change in the fish population of the lake than to the planting of fry and fingerlings.

Species Composition of the Catch

During the 19-year period of this census, Houghton Lake, once a good pike lake, has become a good panfish lake. As was previously stated, pike made up a large percentage of both the summer and winter catches during the early years and became proportionately scarce after 1937. Panfish of course illustrate a reversed trend (Figs. 2-5).

Pike Fishing

It is obvious that pike made up a smaller percentage of the total catch during the latter part of the census. Although it is not possible to state exactly why this is so, several possibilities spring to mind.

1. Sampling might have been biased. As was formerly stated, however, sampling was begun at one end of the lake and terminated at the other, with an attempt to take an actual random sample.

2. Fishermen may have arbitrarily shifted from pike to panfish. Usually anglers will fish for pike when they are abundant enough to be caught in reasonable numbers. During the latter part of the census, fewer people fished for pike, but these fishermen actually took very few (according to residents).

3. Fishing pressure may have increased to the point where there are now not enough pike to go around. Actually, the resident population

of Roscommon County has increased considerably during recent years, and at the same time more tourists have fished Houghton Lake each year. Obviously, fishing pressure has become heavier. However, most anglers fished for panfish during the latter part of the census and pike fishermen took few fish (again according to local residents).

4. There may have been an actual decrease in the number of pike in the lake. This contention is borne out by several facts.

- a. Pike fishermen took few fish during the latter years of the census, and according to Mr. White were even less successful in 1947 and 1948.
- b. Netting operations by the Institute for Fisheries Research in the summer of 1948 failed to take any pike, although pike were formerly caught in the areas netted.
- c. Formerly, 7 tributaries, the Muskegon River, numerous drainage ditches, and much marshland were available for pike spawning. The marshland has been almost completely filled for highway and cottage construction, and the principal drainage now enters the river below the dam instead of the lake. Studies made in the 1940's indicated that the ditches and marshland remaining then were used extensively for spawning.
- d. Prohibition of spearing has failed to improve pike fishing.

Walleye Fishing

Walleyes were never abundant in the catch during any year, but managed to maintain themselves with continual minor fluctuations which cannot now be explained. There have been complaints that during recent years walleyes have been smaller than was formerly the case. There is an unproven theory that a cyclic phenomena occurs in walleye populations, resulting in alternating abundance and scarcity of individuals of certain year classes, and directly related to the cannibalistic tendencies of the fish, and the available food in the lake.

Bass Fishing

Largemouth and smallmouth bass were caught each year in small numbers. It seems that few people fished exclusively for bass at any time during the census, and probably the bass population is not too large to begin with.

Other Panfish

Black crappies were also caught in small numbers, but did not appear in the census records before 1935. According to the 1948 netting records, crappies were not abundant in the lake at that time.

Perch were evidently abundant throughout the census, and made up a good percentage of the total summer catch during certain years. Winter fishermen caught many perch during the early years of the census, but probably concentrated on other panfish from 1937 on. Perch seemed to follow an indefinite cyclic abundance in the catch, the peaks of abundance coming at approximately the same years for both summer and winter line fishing.

Rock bass were not abundant in the early summer catches but made up over 30 percent of the 1935-41 catch, after which they declined somewhat. They never accounted for more than 4 percent of any total winter catch and were not caught at all during some of the early winters of good pike and perch fishing.

Sunfish were present in very low numbers in the summer catches of early years, but assumed enough importance from 1935 on to account for 16.5 percent of the total summer fishing for the 19-year period. Sunfish did not appear in the winter catch until the 1934-35 season, after which, with fluctuations, they made up almost 15 percent of the catch.

Bluegills followed somewhat the same trend as that of the sunfish. Always present, but never an important part of the summer catch for any year, they first appeared in the winter season of 1934-35, and accounted for over 60 percent of the total winter catch of succeeding years. During the last half of the census and in 1947, winter fishermen congregated in certain isolated areas of the lake where bluegills were abundant. Formerly the winter grouping had been the result of intense pike and perch fishing. During at least three of the late winter seasons, bluegills made up over 80 percent of the total catch.

Rough Fish

Rough fish accounted for less than 3 percent of the total summer fishing for the entire census period. Most of these were bullheads, which a few anglers fished for intensely. No rough fish were caught by winter line fishermen, although a few were occasionally speared during the winter prior to the ban on this activity.

The rough fish picture cannot be clearly analyzed, of course, until we know how many fishermen actually do fish for them, how many are caught and thrown back, and until we have some idea of the actual population of rough fish in the lake.

It should not be assumed that a low catch of rough fish is an indication of their actual numbers. Oldtime residents are sometimes surprised to learn that suckers, gars and dogfish are present in their lakes, when that fact is revealed by netting operations.

Species of Fish Recorded

The following species were taken and recorded during the census:

Large predators:

Northern pike
Yellow pikeperch
or walleye

Esox lucius
Stizostedion v. vitreum

Panfish:

Yellow perch
Rock bass
Pumpkinseed
Bluegill
Black crappie
Smallmouth bass
Largemouth bass

Perca flavescens
Ambloplites r. rupestris
Lepomis gibbosus
Lepomis m. macrochirus
Pomoxis nigro-maculatus
Micropterus d. dolomieu
Micropterus salmoides

Rough fish:

Bullhead
Channel catfish
Bowfin
Longnose gar
Common sucker
Redhorse sucker
Pickereel

Ameiurus sp.
Ictalurus l. lacustris
Amia calva
Lepisosteus osseus oxyurus
Catostomus c. commersonii
Moxostoma sp.
Esox sp.

1946 Summer and Winter Fishing

As was stated above, more data were available from the original 1946 creel census slips than had been tabulated on summary cards for preceding years.

Who Fished

Over 90 percent of the summer anglers were "non-residents" (anglers from counties and states other than Rosecommon and Michigan). It is interesting to note that the percentage of non-residents increased from about 71 percent in May to 95 percent in August. In both resident and non-resident groups, male anglers accounted for over 78 percent, and this percentage varied little during any of the months.

Non-residents constituted about 72 percent of the total winter anglers, with percentages of 63 and 78 in January and February respectively. Figures for both summer and winter would seem to indicate that the latter part of both seasons is the most attractive to tourists.

Women accounted for a smaller percentage of the winter anglers, making up less than 15 percent at any time for both groups. Evidently fewer women indulge in ice fishing than in summer fishing, although non-resident women seem to be just as hardy as their resident sisters.

What They Caught

Non-resident catch per hour of 0.43 was slightly higher than for resident summer fishermen, but it should be noted that not enough residents were censused to give a reliable figure. In the same light, winter resident fishermen far outclassed non-resident fishermen with a catch per hour of 0.91 as compared to the 0.65 of the latter.

Non-residents caught their quota of fish, accounting for about 92 percent of the total catch during the summer, and almost 70 percent of the winter catch. Both figures are close to the actual percentage of non-residents among the total anglers. During the summer both groups experienced approximately the same length of fishing trip (partial) and the same catch per angler. During the winter, residents fished an average of 3.61 hours and took home 3.3 fish as compared to 4.65 hours and 3 fish per non-resident.

Non-resident summer fishermen either fished less for or were less successful than residents at catching pike and walleye. These species made up less than 16 percent of the non-resident summer catch, while accounting for almost 28 percent of the catch of residents. Although pike and walleye accounted for little of the winter catch, residents, nevertheless, had a catch including almost 4 percent of walleyes and pike, while the non-resident catch was made up of over 98 percent panfish.

Residents caught larger fish during the summer and slightly smaller fish during the winter than did non-residents. During the summer, pike averaged over 20 inches, walleyes 16, smallmouth 13.8, crappies 9.8, bluegills 8.9, rock bass 8.2, sunfish 8, and perch 7.8. Of fish caught through the ice, pike averaged 21 inches in length, walleyes 17.3, bluegills 8.3, crappies 8.2, rock bass and sunfish 8, and perch 7.6.

Fishing Success

Approximately 39 percent of the summer fishermen were successful. Forty-three percent of the residents and about 38.5 percent of non-residents were successful. Resident males, resident females, non-resident males and

non-resident females were successful in that order, with percentages of about 45, 41, 40 and 33 respectively. Since many anglers had not completed their fishing when contacted these figures, as in those for the length of the fishing day, have only relative significance.

Fishing was better for most anglers who fished through the ice. Over 75 percent caught at least one fish. Of non-residents, 77 percent were successful, while only 72 percent of the residents caught fish. It should be noted, however, that residents as a whole experienced a higher catch per hour and per angler.

Non-resident females, non-resident males, resident males and resident females were successful in that order, with percentages of about 78, 76, 75 and 52 respectively.

Method of Fishing

All of the winter fishermen censused fished through the ice and used natural bait.

One hundred percent of the summer fishermen censused fished from boats. Slightly over 9 percent used artificial bait, which caught less than 6 percent of the total summer catch.

Residence of Fishermen

Of the summer fishermen over 24 percent came from 13 states other than Michigan, and including Washington, D. C. The great majority of out-staters were from Ohio and Indiana. The other non-residents came from 40 counties in Michigan.

Slightly over 3 percent of the winter anglers were from 2 states other than Michigan. The remaining non-residents hailed from 33 counties within Michigan.

Conclusions

1. Average catch per hour showed considerable variation in all but spear fishing, from year to year.
2. Species composition of the catch also showed considerable variation from year to year (excluding spearing).
3. A comparison of the fluctuations in both catch per hour and species composition of the catch suggests that the two are related because size of fish caught is generally inversely correlated with catch per hour.
4. The fluctuations themselves suggest changes in the fish population of the lake and (or) in fishing methods.
5. Observations on the lake reveal that fishing methods have changed from pike to panfish types, especially in winter. That much is obvious. Change in the fish population is indicated by resident statements to the effect that it is now difficult to take pike even when fishing for them. Destruction of pike spawning grounds is an obvious possible factor.
6. All in all, the data suggests changes but does not offer scientific proof of the existence of factors which might cause them to take place. The cause must, in this study, be merely guessed at, with only apparent data and independent observations as the tools.

References

Beckman, W. C.

1948. The Rate of Growth of Some Fishes from Houghton Lake, Roscommon County, Michigan. Inst. for Fish. Res. Rept. No. 1196.

Carbine, W. F.

1940. Houghton Lake Northern Pike Investigations, 1939 Progress Report. Inst. for Fish. Res. Rept. No. 583.
1941. Observations of the Life History of the Northern Pike (Esox lucius) at Houghton Lake, Michigan. Trans. Amer. Fish. Soc., 71 (1941), 149-164.
1942. Observations Made on Spawning Conditions for Northern Pike at Houghton Lake, March 25 to April 1, 1942. Inst. for Fish. Res. Rept. No. 766.
1942. Northern Pike Investigations Conducted at Houghton Lake, 1942. Inst. for Fish. Res. Rept. No. 811.

Carbine, W. F., and V. C. Applegate

1946. Recapture of Tagged Walleyes, Stizostedion v. vitreum (Mitchell), in Houghton Lake and the Muskegon River, Roscommon County, Michigan. Inst. for Fish. Res. Rept. No. 1039.
1946. The Movement and Growth of Marked Northern Pike (Esox lucius, L.) in Houghton Lake and the Muskegon River. Inst. for Fish. Res. Rept. No. 1038.

Eschmeyer, R. W.

1936. A Study of the Trend in the Fish Catch from Houghton Lake, 1928-1934. Inst. for Fish. Res. Rept. No. 363.

Eschmeyer, R. W.

1936. Houghton Lake Creel Census, Winter of 1935-36. Inst. for Fish. Res. Rept. No. 368.
1936. Discussion of the Status of Northern Pike Fishing with Special Reference to Houghton Lake. Inst. for Fish. Res. Rept. No. 387.
1937. Houghton Lake Creel Census, Winter of 1936-1937. Inst. for Fish. Res. Rept. No. 417.

Greeley, John R.

1948. Fish Populations Necessary for Successful Angling. Trans. of the 13th N. Amer. Wildl. Conf.

Hazzard, A. S.

1936. The Need for and Probable Consequences of Restriction of the Take of Great Northern Pike in the Designated "Pike Lakes" of Michigan, with Special Reference to Houghton Lake. Inst. for Fish. Res. Rept. No. 388.

Livingston, M. L.

1946. Some Notes on the Foods of Northern Pike and Walleyes in Houghton Lake, Michigan. Inst. for Fish. Res. Rept. No. 1068.

Mottley, Charles M.

1948. A National Program of Fish Production, Research, and Management. Trans. of the 13th N. Amer. Wildl. Conf.

INSTITUTE FOR FISHERIES RESEARCH

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Table 1

Totals for each year of summer fishing, 1928-1946, on Houghton Lake.

Year	Number of fishermen censused	Number of hours fished	Number of fish caught	Average catch per hour	Number of lines allowed per angler
1928	13,354	9,956.0	2,557	0.26	1
1929	13,964	11,501.5	3,054	0.26	1
1930	3,745	11,190.25	2,677	0.24	1
1931	1,319	4,457.25	1,177	0.26	1
1932	1,535	4,885.5	2,886	0.59	1
1933	2,139	6,215.5	4,085	0.66	1
1934	746	2,028.0	2,419	1.19	2
1935	1,218	2,751.75	3,514	1.28	2
1936	...	...	...	...	...
1937	1,176	2,628.5	4,639	1.76	2
1938	2,367	5,679.5	6,306	1.11	2
1939	3,574	8,310.75	7,686	0.92	2
1940	3,312	6,637.0	4,442	0.67	2
1941	3,154	7,294.25	3,545	0.49	2
1942	5,229	11,402.25	4,675	0.41	2
1943	3,614	6,956.25	3,826	0.55	2
1944	3,003	6,291.25	1,799	0.29	2
1945	1,860	3,371.25	999	0.30	2
1946	2,006	3,724.5	1,580	0.42	2
Totals	47,315	115,281.25	61,866	0.54	

Sum of figures calculated by separate months, May, June, July, August and September, from years 1930-33, when available.

Table 2

Totals for each season of winter line fishing, 1930-31 through 1945-46,
on Houghton Lake.

Year	Number of fishermen censused	Number of lines used	Number of hours fished	Number of fish caught	Average catch per hour	Number of lines allowed per angler
30-31	✓103	142	✓445.5	254	✓0.57	5
31-32	✓112	226	✓452.0	524	✓1.16	5
32-33	390	923	1,877.5	2,023	1.08	5
33-34	199	359	683.0	457	0.67	5
34-35	391	...	1,285.0	878	0.68	5 & 2
35-36	...	...	...	...	...	2
36-37	...	...	...	...	...	2
37-38	648	...	2,186.5	3,087	1.41	2
38-39	867	...	3,616.25	5,168	1.43	2
39-40	1,335	...	5,431.25	3,270	0.60	2
40-41	2,056	...	9,777.75	8,412	0.86	2
41-42	931	...	4,192.25	3,970	0.95	2
42-43	929	...	3,717.75	3,198	0.86	2
43-44	1,342	...	6,110.5	3,927	0.64	2
44-45	1,201	...	5,546.0	3,621	0.65	2
45-46	1,164	...	5,067.5	3,597	0.71	2
Totals	11,668	...	50,388.75	42,386	0.84	...

✓ Sum of figures calculated by separate months, December, January, February, and March, from years 1933 and 1934, when available.

Table 3

Totals for each season of winter spearing, 1930-31 through 1938-39,
on Houghton Lake.

Year	Number of fishermen censused	Number of hours fished	Number of fish caught	Average catch per hour
28-29	...	...	...	...
29-30	...	...	...	...
30-31	966	3,554	909	0.26
31-32	231	1,012	315	0.31
32-33	77	340	103	0.30
33-34	154	575.5	153	0.27
34-35	35	81	34	0.42
35-36	...	...	...	...
36-37	...	...	...	...
37-38	226	856	202	0.24
38-39	111	405	106	0.26
Totals	1,800	6,823.5	1,822	0.27

Table 4

Accumulated totals for May, June, July, August and September, 1928-46 (excluding 1936), on Houghton Lake.

Date	Number of fishermen censused	Number of hours fished	Number of fish caught	Average catch per hour		Northern pike	Walleye	Perch	Rock bass	Sunfish	Bluegill
May ¹ ✓	9,683	29,509.00	12,718	0.43	Number fish caught	4,413	2,464	1,171	4,124	41	...
					Percent of May catch	34.69	19.37	9.21	32.43	0.32	...
June ¹ ✓	10,672	27,913.75	12,039	0.43	Number fish caught	3,826	1,592	1,478	2,660	1,172	808
					Percent of June catch	31.78	13.22	12.28	22.09	9.74	6.71
July ¹ ✓	14,072	31,369.25	19,286	0.61	Number fish caught	1,831	1,093	5,389	4,689	4,762	935
					Percent of July catch	9.49	5.67	27.94	24.31	24.69	4.85
August ¹ ✓	10,867	21,789.00	15,469	0.71	Number fish caught	1,352	825	4,859	3,491	3,889	556
					Percent of August catch	8.74	5.33	31.41	22.57	25.14	3.59
Sept. ¹ ✓	2,021	4,700.25	2,354	0.50	Number fish caught	191	103	1,216	336	346	101
					Percent of Sept. catch	8.11	4.38	51.67	14.27	14.70	4.29
Totals	47,315	115,281.25	61,866	0.54	Number of fish	11,613	6,077	14,113	15,300	10,210	2,400
					Percent of total	18.77	9.82	22.81	24.73	16.50	3.88

¹ Contains calculated data from years 1928 and 1929.
² Illegal.
³ Identification doubtful.

Black crappie	Small-mouth bass	Large-mouth bass	Bullhead	Gar	Dogfish	Sucker	Channel catfish	Pickering ³	Pike and walleye	Panfish	Rough fish
101 0.79	1 ² 0.01	... ...	367 2.89	1 0.01	33 0.26	1 0.01	1 0.01	... ...	6,871 54.06	5,438 42.76	403 3.18
41 0.34	63 0.52	25 0.21	291 2.42	1 0.01	81 0.67	1 0.01	... ...	... ...	5,418 45.00	6,247 51.89	374 3.11
25 0.13	131 0.68	8 0.04	361 1.87	3 0.02	30 0.16	4 0.02	24 0.12	1 0.01	2,924 15.16	15,939 82.64	423 2.20
17 0.11	120 0.78	19 0.12	306 1.98	... ...	18 0.12	17 0.11	... ...	... ...	2,177 14.07	12,951 83.72	341 2.21
... ...	13 0.55	2 0.08	46 1.95	... ...	... ...	... ...	... ...	... ...	294 12.49	2,014 85.56	46 1.95
184 0.30	328 0.53	54 0.09	1,371 2.22	5 0.008	162 0.26	23 0.04	25 0.04	1 0.002	17,690 28.59	42,589 68.84	1,587 2.57

Table 5

Accumulated totals for December, January, February and March, 1930-31 through 1945-46 (excluding 1935-36 and 1936-37) for winter line fishing¹ on Houghton Lake.

Date	Number of fishermen censused	Number of hours fished	Number of fish caught	Average catch per hour							Black crappie	Pike and walleye	Panfish	
					Northern pike	Walleye	Perch	Rock bass	Bluegill	Sunfish				
Dec.	2421	21,678.00	1,838	21.10	Number fish caught	26	6	61	83	1,407	255	...	32	1,806
					Percent of Dec. catch	1.41	0.33	3.32	4.52	76.55	13.87	...	1.74	98.26
Jan.	24,517	219,040.50	17,798	20.93	Number fish caught	984	660	1,918	192	11,716	2,262	66	1,644	16,154
					Percent of Jan. catch	5.53	3.71	10.78	1.08	65.82	12.71	0.37	9.24	90.76
Feb.	26,166	227,225.00	20,533	26.75	Number fish caught	417	251	1,927	462	13,746	3,551	179	668	19,865
					Percent of Feb. catch	2.03	1.22	9.38	2.25	66.96	17.29	0.87	3.25	96.75
March	2564	22,447.25	2,217	20.91	Number fish caught	676	191	816	10	380	144	...	867	1,350
					Percent of March catch	30.49	8.62	36.80	0.45	17.14	6.50	...	39.11	60.89
Totals	11,668	50,388.75	42,386	0.84	Number of fish	2,103	1,108	4,722	747	27,249	6,212	245	3,211	39,175
					Percent of total	4.96	2.61	11.14	1.76	64.29	14.66	0.58	7.57	92.43

¹ Changes in fishing seasons for sunfish and bluegills:

- 1928 - June 16 - March 31.
- 1930 - June 25 - December 31.
- 1931 - June 25 - March 31.
- 1934 - June 25 - April 30.
- 1938 - June 25 - March 1.
- 1940 - June 25 - March 15.
- 1942 - June 25 - February 28.

² Contains calculated data from 1930-31 and 1931-32 seasons.

Table 6

Accumulated totals for December, January, February and March, 1930-31 through 1938-39 (excluding 1935-36 and 1936-37) for winter spearing¹ on Houghton Lake.

Date	Number of fishermen censused	Number of hours fished	Number of fish caught	Average catch per hour		Northern pike	Walleye	Sucker	Gar	Dogfish	Pike and walleye	Rough fish
Dec.	281	971.5	449	0.46	Number fish caught	447	1	1	...	...	448	1
					Percent of Dec. catch	99.56	0.22	0.22	...	...	99.78	0.22
Jan.	751	2,931.0	760	0.26	Number fish caught	745	6	3	3	3	751	9
					Percent of Jan. catch	98.04	0.79	0.39	0.39	0.39	98.83	1.17
Feb.	642	2,475.5	536	0.22	Number fish caught	529	3	2	...	2	532	4
					Percent of Feb. catch	98.70	0.56	0.37	...	0.37	99.26	0.74
March	126	445.5	77	0.17	Number fish caught	53	...	24	...	...	53	24
					Percent of Mar. catch	68.83	...	31.17	...	...	68.83	31.17
Totals	1,800	6,823.5	1,822	0.27	Number of fish	1,774	10	30	3	5	1,784	38
					Percent of total	97.37	0.55	1.65	0.16	0.27	97.92	2.08

¹ Spearing seasons:
 1928-29 - None.
 1930-33 - When frozen.
 1934-39 - January and February.
 1940-46 - None.

Figure 1

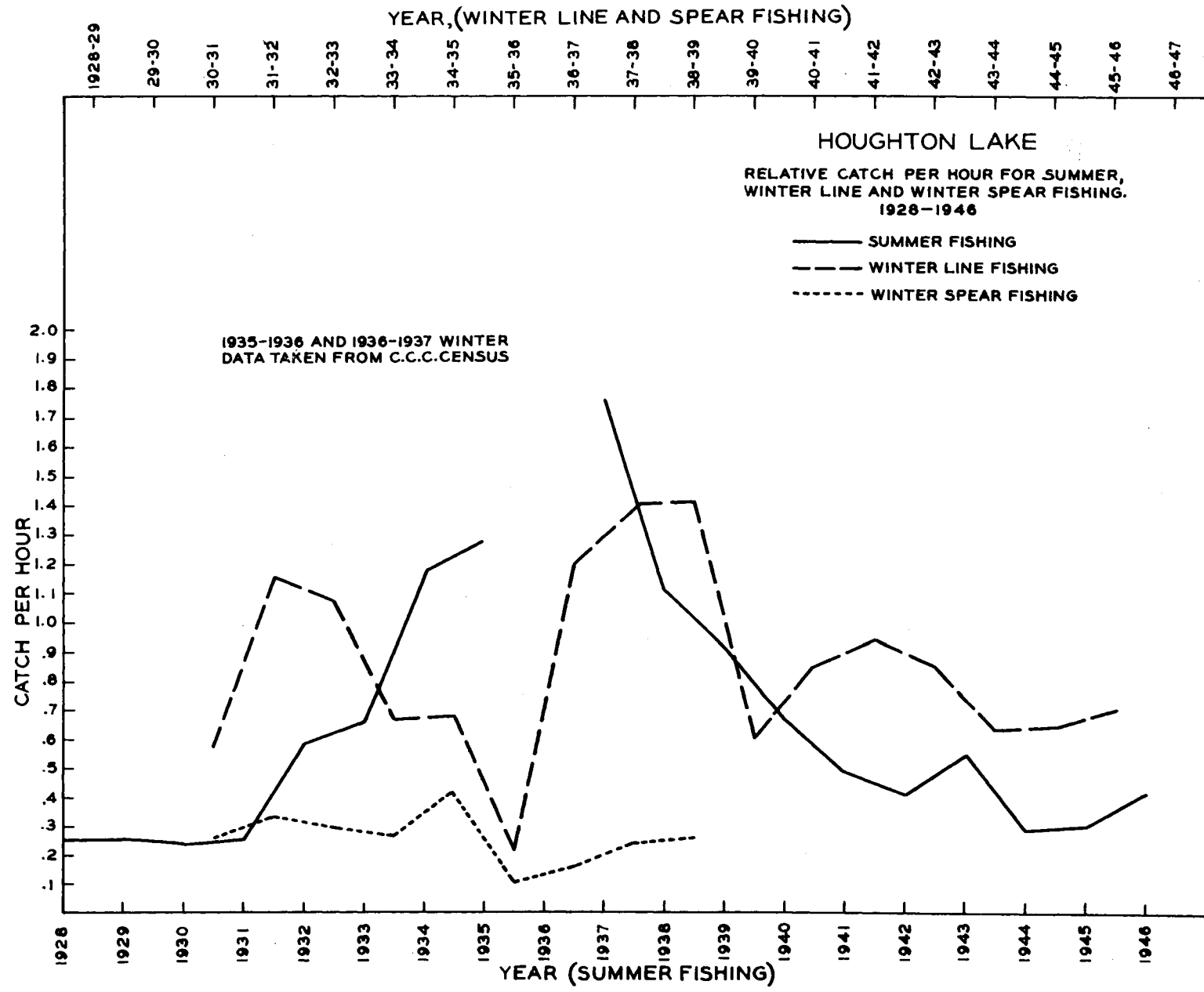


Figure 2

HOUGHTON LAKE

COMPARISON OF AVERAGE CATCH PER HOUR FIGURES WITH PERCENTAGE OF PIKE AND COMBINED PERCENTAGE OF PIKE AND WALLEYE IN THE CATCH, 1928-1946 SUMMER FISHING.

- CATCH PER HOUR
- - - PERCENTAGE OF PIKE
- · · · · PERCENTAGE OF WALLEYE AND PIKE



Figure 3

HOUGHTON LAKE
COMPARISON OF AVERAGE CATCH PER HOUR
WITH PERCENTAGE OF PANFISH IN THE CATCH,
1928-1946 SUMMER FISHING.

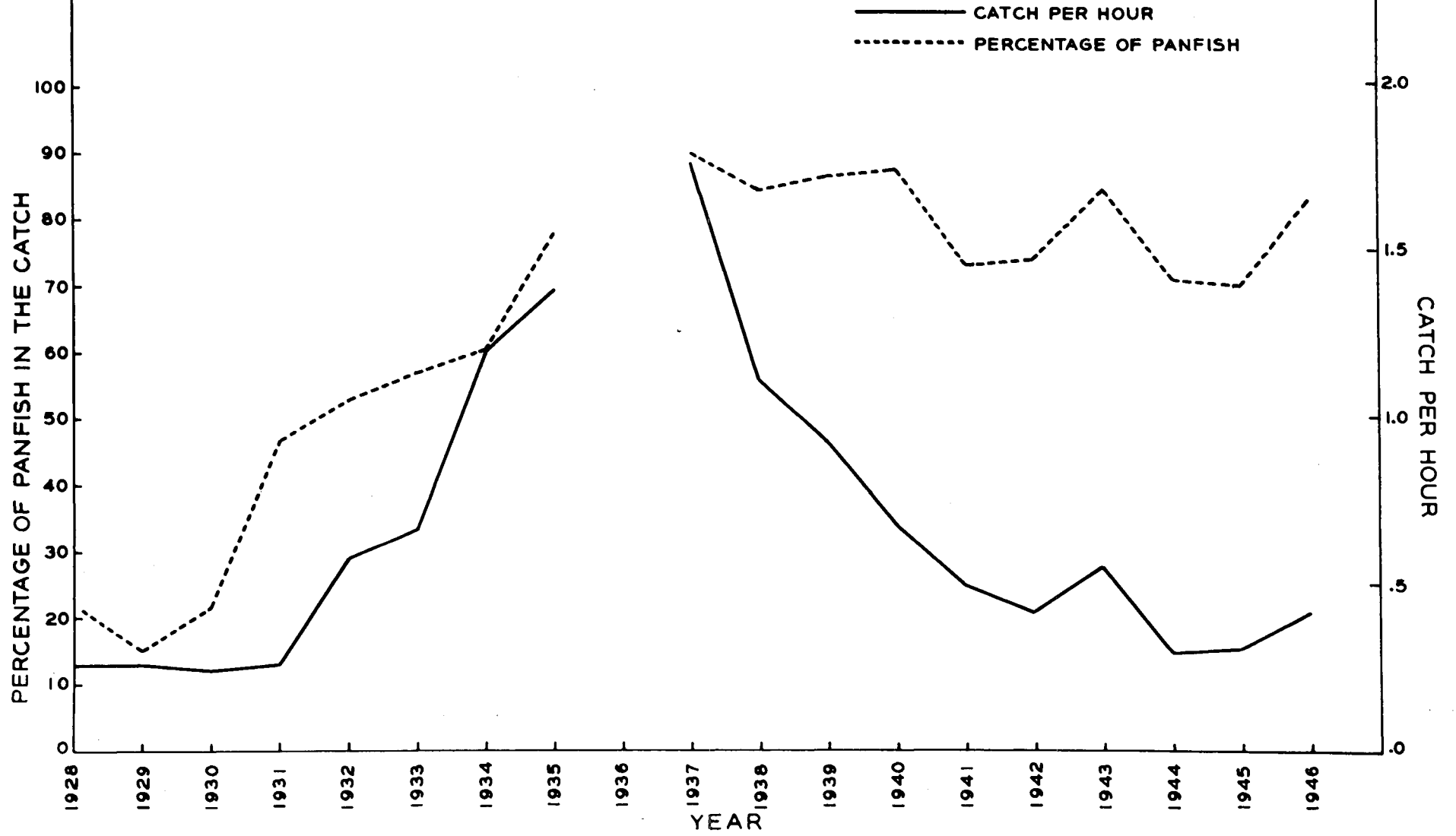


Figure 4

HOUGHTON LAKE

COMPARISON OF AVERAGE CATCH PER HOUR WITH PERCENTAGE OF PIKE IN THE TOTAL CATCH, 1930-1931 TO 1945-1946 WINTER LINE FISHING.

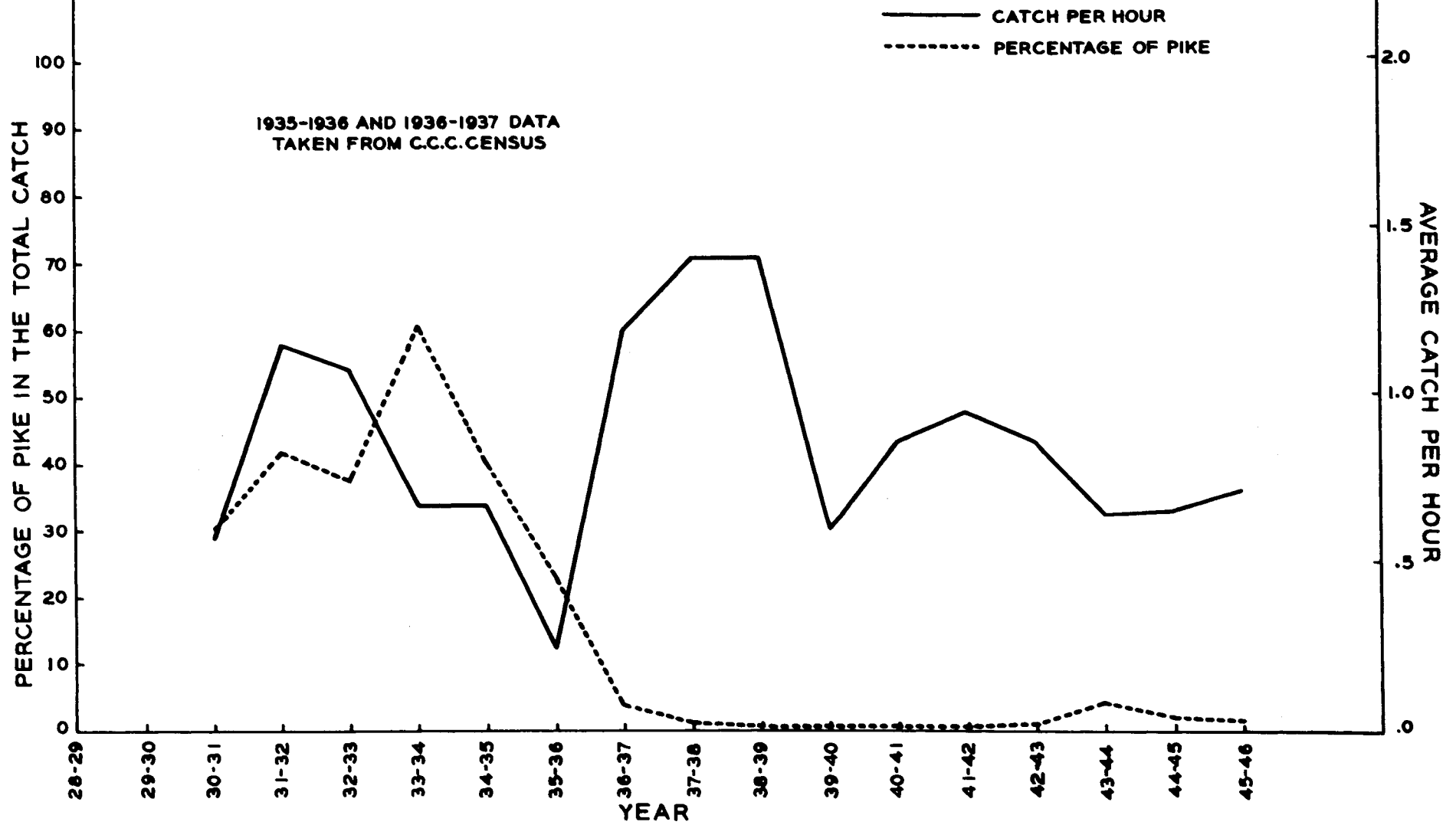


Figure 5

HOUGHTON LAKE

COMPARISON OF AVERAGE CATCH PER HOUR WITH PERCENTAGE OF BLUEGILLS AND PERCENTAGE OF PANFISH (INCLUDING BLUEGILLS) IN THE TOTAL CATCH. 1930-1931 TO 1945-1946 WINTER LINE FISHING.

- CATCH PER HOUR
- - - PERCENTAGE OF PANFISH INCLUDING BLUEGILLS
- · · PERCENTAGE OF BLUEGILLS

1935-1936 AND 1936-1937 DATA
TAKEN FROM C.C.C. CENSUS

