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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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REPORT NO. 754

FISHERIES RESEARCH ACTIVITIES IN THE UPPER PENINSULA:

JULY 1, 1940 TO JUNE 30, 1941 AND
JULY 1, 1941 TO JANUARY 1, 1942.

(Introduction by A. S. Hazzard)

The Institute is the research branch of the Fish Division, created to test present methods for maintaining and improving fishing, and to develop and test new methods of fisheries management. Conservation administrators are increasingly aware of the necessity for having scientifically dependable information upon which to base their policies and recommendations to the legislature. It is the job of the Institute to secure this information on the sport fisheries for the Conservation Department. A statement of the kinds of research carried on in the Upper Peninsula during this period is followed by more detailed reports on these projects by staff members most concerned with them.

District Fisheries Biologist.

Because of the distance from the Upper Peninsula of the main laboratory and office of the Institute (Ann Arbor), the Conservation Department decided to establish the first two district fisheries biologists in the Upper Peninsula. Accordingly, in January, 1941, Paul Eschmeyer was stationed in Fisheries District No. 1 with headquarters at the Watersmeet Fish Hatchery. A summary of his activities for the

past year is included in this report. In September, 1941, Eugene Roelofs was appointed Fisheries Biologist for District No. 2, with headquarters at the Thompson Hatchery. Roelofs is to be held in Ann Arbor until March 15 for additional training and to assemble data and make up survey reports on waters in his District. It is believed that the district biologist plan will make possible prompter and more adequate attention to research problems in the Upper Peninsula than has been possible heretofore.

Lake and Stream Surveys.

We need to have an accurate inventory of our fishing waters--their size, depth, temperature, bottom types, chemical nature, suitability for different species of fish, need for stocking, improvement, etc. Hence the progress of lake and stream surveys is important.

Creel Census.

We need to know what sort of fishing these waters are producing. The general creel census, carried on since 1923 by the Conservation officers in connection with their regular patrol duties, supplies a good cross-section of the fishing in all parts of the state. On certain problem waters, a more complete record of the catch may be desirable, for example in the case of Lake Gogebic, described in a following report. A good census of the anglers' catch before and after the closing of certain waters to commercial fishing shows whether such a closure was needed and if it resulted in any improvement in the sport fishing. If an accurate test of different fish planting methods is to be made, a census of the catch resulting from such plantings must be secured. After all, the real test as to whether any conservation practice does any good is whether the yield is increased.

Habits and Requirements of Fish

If we are to plant fish in waters where they will grow and give results, or if we are to improve the habitat for certain species, we must first know what conditions they require. Lake and stream surveys have shown that Michigan has a great variety of waters--some deep and cold, others shallow and warm, but others with all sorts of combinations of depth, bottom type, food supplies, etc. Different species of fish have different requirements, but not enough is known about these requirements in all cases to be sure of the results to be expected from stocking, environmental improvement or legal restrictions.

While much of the research on the breeding habits and needs of fishes has been done in the Lower Peninsula, the results will be applicable in most cases to the northern waters. The breeding and feeding habits of the walleyed pike are being investigated by the District Fisheries Biologist located in the western end of the Upper Peninsula.

The movements of fish in streams and their movements into and out of lakes are the subject of much controversy. Tagging and the use of fish traps which catch fish moving in either direction furnish the facts needed to answer such questions. Such a two-way trap was maintained for two years on the outlet of Lake Gogebic.

The average rate of growth of the important game fish is being determined for various parts of the state. By comparing the growth rate in any lake or stream with these averages, it is possible to say whether fish are stunted and should be removed or reduced in number, or whether their growth is good or above average. Scales of several thousand fish from Upper Peninsula waters have been aged during this period. The time when the annulus or year mark forms on the scale and the amount of growth

at different months during the year have been determined for different parts of the state by Dr. W. C. Beckman. As might be expected, the annulus forms later in the Upper Peninsula water and the growing season is somewhat shorter. The amount of growth made in a year, however, is about the same for most species studied.

Restoration of Trout Lakes

Prior to July 1, 1939, a number of small Michigan lakes had been found to have temperature and oxygen content suitable for trout, but the presence of stunted perch or other competing fish invariably caused failure when trout were planted. A method was developed by the Institute (which has since been used with good results in a number of places in North America) by which these lakes could be "poisoned out" and restocked with trout. It is suspected that there may be several hundred small lakes in the Upper Peninsula which can be made suitable for trout by this method. As fast as these lakes can be located and surveyed, they will be treated for stocking with trout.

Experimental Fish Plantings

Surveys of a number of Upper Peninsula lakes have indicated that it may be possible to improve the fishing by the introduction and establishment of some species of fish not now present. For example, some of the larger lakes have sizable areas of deep, cold water with sufficient oxygen for trout. By planting large-sized trout late in the fall, just before freeze-up, at a time of year when bass, pike, etc., are relatively inactive, there may be very little loss and the variety and quantity of the fish crop may improve. In other lakes, the introduction of a forage fish may increase the growth and the crop of fish-eating species such as bass, pike, trout, etc. In still others not having trout possibilities,

it may be that establishing one of the predaceous fishes such as bass or pike may control the numbers of perch, sunfish, etc., and result in good fishing for the introduced game fish and improved growth of the original occupants of the lake.

Little is known as to the results of such attempts to vary or control fish populations, but it appears that this may be a very productive line of research. By reference to the survey section of this report, it will be seen that a number of such introduction experiments have been planned for Upper Peninsula lakes. The presence of District Fisheries Biologists will make it possible to keep a close check on the results of these experiments.

Lake Fertilization

The possibility that the addition of fertilizer of some sort may increase the fish food supply in poorer lakes has been suggested and to some extent tested by experiments. Research workers of the Wisconsin Natural History Survey have shown that, of the fertilizers tested, soy bean meal increased the growth rate of perch in one lake. Workers in the southern states make great claims for certain inorganic commercial fertilizers.

Our lake surveys have demonstrated a very low carbonate content in some Upper Peninsula lakes which now have very poor fishing, and it is suspected that other necessary elements are also lacking. Since he was especially trained in the analysis and study of water soils, Dr. Eugene Roelofs, District No. 2 Fisheries Biologist, will conduct a number of experiments in the Upper Peninsula during the coming year to determine the feasibility and practicability of increasing lake fertility.

Miscellaneous Research

In order to decrease the loss from disease at the Department's hatcheries and rearing stations, it is planned to secure the services of a fish pathologist during the coming fiscal year. This man will also be available to investigate fish diseases and losses in natural waters, such as the mortality of smelt which occurred in the spring of 1941 in Bay de Noc.

Further research in fish nutrition, with the object of raising hardier fish by the cheapest method, may also be undertaken this year.

During 1941, observations were made to determine the effect on trout and trout food of Dendrol (an oil insecticide), used to control blackflies in certain small Keweenaw County streams. Experiments to determine the killing effect of different concentrations of Dendrol on fish food and trout are now being conducted at the Hunt Creek Fisheries Experiment Station near Lewiston, Michigan. Further experiments in its use are planned for this year in Keweenaw County.

A study of the effects upon fish life of the diversion of the Middle Branch of the Ontonagon River, and on Sucker and Bluff Creeks, will have high priority on the program of District No. 1 Fisheries Biologist. The Director of the Institute and Dr. David Shetter, trout specialist, will work with Mr. Eschmeyer on this problem.

The food of otter taken during the spring trapping season of 1940 has been studied by Dr. Karl Lagler of the University of Michigan, and Mr. Burton Ostenson of Michigan State College. While their report did not separate the results for the Upper Peninsula, somewhat more than a third of the stomachs examined came from this part of the state, so that their conclusions should apply to the Upper Peninsula. Following is a

summary of their findings taken from Institute for Fisheries Research
Report No. 642:

Table 3. Summary of early spring food of otter in Michigan

Based on the contents of 109 stomachs (1524.9 cc. of food) and of 130 intestines. The data in this table combine those of Tables 1 and 2 with the additional findings in 38 stomachs and 36 intestines from otter which lacked specific locality data.

FOOD ITEM	STOMACHS		INTESTINES	
	% of total volume of food	% frequency of occurrence	% of total volume of food	% frequency of occurrence
Game and pan fish	26.6	27.5	14.3	40.0
Forage fish	14.6	56.0	24.7	68.5
Other fish	0.5	2.8	1.6	4.6
Unidentified fish remains	2.8	38.5	9.7	43.8
Amphibians	12.1	11.0	7.5	20.8
Other vertebrates	36.7	1.8	0.9	0.8
Insects	1.2	17.4	5.1	30.0
Crayfish	5.4	34.9	36.2	54.6
Molluscs	...	...	Trace	1.5
Total	99.9		100.0	

"The summary (Table 3) of all the food habits data obtained, including those from 38 stomachs and 36 intestines of otter which lacked specific locality data, give a limited picture of the early spring food of otter in Michigan. The large portion (36.7 per cent) of the total volume of stomach contents represented by "other vertebrates" is due to the presence of one snowshoe hare in one stomach and remains of part of a large bird (unidentified) in another. These items, however, are not repeated in other otter and thus are by no means staple items in the food of these animals.

"It should be noted that percentage of volume of food organisms having fewer hard parts and more soft parts (such as fish) decreases markedly from stomach to intestine. Food items having more hard parts and lesser soft parts (such as crayfish) appear to increase decidedly in percentage of total volume from stomach to intestine.

"Conclusions based on analyses of stomach contents, intestinal contents, or scat contents must each be reserved. Caution must also be exercised in interpreting frequency data in intestines due to persistence of hard parts. This persistence may lead to erroneous interpretation of the significance of 'number of individuals eaten' or 'percentage frequency of occurrence.'

"It seems apparent that fish, crayfish, and amphibians constitute most of the spring food of the otter, whereas large aquatic insects comprise a minor amount although they are consistently taken. Rare items are molluscs, birds, and mammals. Reptiles are perhaps not yet available; otter are known, however, to feed on turtles. Principal food organisms are characteristic bottom dwellers (e.g., mud minnows, crayfish) and disclose something of the nature of the feeding habits of this animal.

"The data obtained on the food of the otter in early spring as presented in this report have implications for fish management as well as for otter management. The information given is obviously limited in the small part of the year which it covers and in the relatively small numbers of individuals included. It is further restricted as to its interpretation by the small amount of knowledge recorded on the habits and physiology (rate of digestion, frequency of feeding, daily food requirements, etc.) of the otter and also the size and distribution of the population in the state. Judging from the relatively small number trapped during the past open season and from the breadth of diet shown in this report and in scat studies of Michigan otter by other agencies (U. S. Biological Survey, records in Game Division files, Institute for Fisheries Research Report Numbers 356 and 367), it would seem that far greater concern need be felt over the stability of the population of this predator in the state than could justifiably be expressed for any of its prey species due to the effects of predation by the otter. In instances where otter have very restricted feeding grounds, such as in isolated kettle-hole lakes, this conclusion will not hold. Live-trapping and transportation to larger streams is recommended in these instances."

The stomachs collected in the 1941 trapping season have now been examined and the report is in preparation.

Summary reports of the fisheries research conducted in the Upper Peninsula during the last fiscal year and for the first half of the present fiscal year follow.

1.--Report of Major Activities of District Fisheries

Biologist, Hatchery District #1,

1941

by

Paul Eschmeyer

1. Made monthly collections of trout of 3 species from hatchery troughs during their early period of development, and preserved samples of adults of several other species during year, for display and study collection.

2. With a crew of 2 members of the staff of the Watersmeet Hatchery, made winter physical surveys of Lac LaBelle, Keweenaw County, and Otter Lake, Houghton County. Wrote short reports on the information obtained (in addition to contour maps) concerning the two lakes.

3. Tagged a total of 284 trout (brook and rainbow) with 6 different types of fish tags, applied in 4 different ways, to compare the different methods of tagging and the different types of tags. Summarized observations to date in Institute Report No. 701, "Notes on Fish Tag Comparison Experiment" (November 28, 1941)

4. Made late winter water analyses of 8 lakes of the Ottawa National Forest to determine their suitability for trout. The results were summarized in Institute for Fisheries Research Report No. 630-A, "Late Winter Water Analyses of Several Proposed Trout Lakes of the Ottawa National Forest", December 12, 1941.

5. Made a series of observations on the Slate River near Lake Gogebic to determine the probable effect of early season fishing in the river on the northern pike population of Lake Gogebic. Results were summarized in

Institute Report No. 712, "Notes on Early Season Fishing in 1941 in the Lower Slate River, Gogebic County, Michigan" (December 15, 1941).

6. Supervised the operation of the Lake Gogebic weir and the Lake Gogebic creel census.

7. Made a rather extensive series of observations on the spawning and subsequent development of the young of walleyed pike in Lake Gogebic. Results were summarized in Institute Report No. 695, "Notes on the Natural Reproduction of Walleyed Pike in Lake Gogebic", (November 17, 1941).

8. Investigated the extent and possible cause of, and reported upon an unusual smelt mortality in Little Bay de Noc, during early May.

9. Observed the use and investigated the effects of an insecticide (Dendrol) on two Keweenaw County streams. Results were summarized in Institute Report No. 697, "The Use of Dendrol in Control of Black Flies in Keweenaw County, 1941", (November 25, 1941).

10. Set nets and took specimens from Little Duck Lake and Range Line Lake, Gogebic County, to determine whether bass could be moved from the waters to other lakes for stocking. Made similar collections in Still, Pine and Fuller Lakes, near Sidnaw (Houghton County) with Conservation Officer Delene.

11. Began the collection of data for a study of competition in streams between trout and minnows.

12. Assisted in the poisoning of and subsequent collecting of fish in Witch Twin and Holland Lakes.

13. Made shoreline maps and partial inventories of Lake on the Hill, Gogebic County, and Eliza Lake, Keweenaw County; completed inventory of Ongie Lake, Houghton County.

14. With Dr. Hazzard, assisted in the surveys of Ackerman Lake, Alger County; Deadman Lake, Gogebic County; Marten Lake, Iron County; Lac LaBelle, Keweenaw County; Holland Lake, Luce County; Sporley Lake, Marquette County, and Mirror and Moll Lakes, Ontonagon County.

15. Completed regular Institute for Fisheries Research lake reports on Gogebic Lake (March 17, 1941), Marten Lake (Number 711, December 15, 1941), Lac LaBelle (Number 717, December 18, 1941), and Deadman Lake (Number 719, December 22, 1941).

16. Tagged 150 trout and supervised their planting in the Ontonagon River near Watersmeet.

17. Attended Midwest Wildlife Conference, and Northern Michigan Sportsmen's Association meetings.

18. Investigated reported fish mortalities at Marten Lake, Iron County, and Brule Lake, Iron County. Briefly investigated pollution in Pilgrim River, Houghton County. With Mr. Clark, inspected the Little Iron River, Big Iron River, and Union River, Ontonagon County, for possible stream improvement projects. Inspected diseased trout at hatchery on several occasions.

2.--Surveys and Management Reports of Lakes of the
Upper Peninsula of Michigan, for the Period
Extending from July 1, 1940 to January 1, 1942

by

Paul Eschmeyer

The Institute for Fisheries Research has conducted a number of lake surveys in the Upper Peninsula during the past 5 years. The results of

many of the inventories did not appear in report form prior to July, 1940. During the succeeding 12-month period, detailed reports of investigations on 33 lakes were summarized in the form of regular Institute for Fisheries Research survey reports, and management proposals for improvement of the fishing in the various waters were made. During the period from July 1, 1941 to January 1, 1942, the field data from 14 other lakes were similarly treated. Lists of the lakes reported upon during the two periods are shown in Tables I and II.

During the period from July 1, 1940 to June 30, 1941, fisheries surveys were made of 15 lakes located in the Upper Peninsula. From July 1, 1941 to January 1, 1942, 9 additional lakes were surveyed. A record of the surveys made during the two periods is given in Tables III and IV. In addition to these surveys, 20 lakes were sounded and mapped by the C.C.C. under the general direction of the Institute in the former period, and 2 more lakes in the latter period.

The lakes which have been reported upon during the two periods have included waters of almost every type which occurs in the Upper Peninsula, ranging from 2 to over 14,000 acres in size, and ranging from geologically recent sand and gravel bottomed lakes to bog lakes swiftly approaching extinction. Recommendations for the improvement of the waters for fishing have been equally varied. A summary of the management proposals for the lakes during the two periods is shown in Tables V and VI.

During the period from July 1, 1940 to June 30, 1941, recommendations were made for the change in classification of 7 lakes from "all others" to trout lakes, and the planting of trout was advised. All of these were waters which had been found suitable for trout during the course of the surveys. The introduction of trout without material alteration of the

existing fish population in the lake was recommended in 6 out of the 7 waters, while in the 7th lake (Twin Lake, Marquette County), poisoning of the other fish before the introduction of trout was advised. Conditions in the latter lake were such that it could not logically be expected that trout would survive and grow well in the presence of competitive species.

In the July 1, 1941 - January 1, 1942 period, a change in classification from "all others" to pike lakes was recommended for 5 lakes. In all 5 of these waters, the northern pike was the dominant fish, with the yellow perch being common in 4 of them. These two species spawn in the very early spring, soon after the ice cover leaves. The change in classification has the effect of opening the lakes to fishing over a month earlier in the spring, at a time of year when pike and perch fishing is generally good. Since no other pike lakes are found in the immediate vicinity of the re-classified lakes in some cases, anglers in the vicinity are given an opportunity to engage in lake fishing earlier than would otherwise be the case.

In 16 lakes reported upon between July 1, 1940 and June 30, 1941, and 8 lakes for which management plans were formulated during the succeeding 6-month period, the discontinuation of all stocking was recommended. The surveys disclosed that some lakes were being periodically stocked with species which were already present in the waters concerned in such abundance that they were stunted in growth, or where spawning facilities were adequate to insure the perpetuation of the species. Other lakes were being stocked with species considered to be unsuited to them in the light of information secured by the surveys. In still others, stocking was being undertaken which, if successful, might seriously upset the biotic balance in the lakes, (e.g., stocking of walleyes in a lake

of small size in which northern pike or bass already occur, thus upsetting the established predator-prey relationship by adding another predator).

In 6 lakes which had been annually stocked with large numbers of walleye fry, it was advised that such stocking be curtailed to alternate years or discontinued entirely for a period of several years, until further observations could be made to determine whether the species spawns naturally in the waters concerned.

Stocking of brook or rainbow trout was advised for 9 lakes; lake trout for 2; adult northern pike for 4; cisco (for forage for trout) for 3; forage minnows for 2; and bluegills (one of the previously most frequently stocked species for the group of lakes discussed here) for only one (Lake Gogebic). In some lakes in which the stocking of rainbow trout was suggested, it was further recommended that the water be opened to fall fishing for this species.

Fertilization of lakes in order to increase the production of fish was in many cases suggested as a means of improving the fishing, but in most cases it was acknowledged that under existing fishing pressures such a costly procedure would not be economical. However, four lakes were singled out as experimental waters in which it is hoped that fertilization can be undertaken, to better determine the value of this management method in improving the productivity of a lake. Those chosen are Pilot Lake, Gogebic County; Markey Lake, Houghton County; Twin Lake, Marquette County; and Stoner Lake, Alger and Delta Counties. The lakes range in size from 22 to 72 acres. Two are essentially trout lakes, while the others are in the "all others" classification. Results obtained from the experiments to be conducted on these lakes will be helpful in the management of other waters.

It was recommended that brush shelters be added to improve cover conditions in 5 of the 47 lakes covered by the reports during the 2 periods. Improvement of spawning facilities was not recommended for any of the lakes.

Proper operation of outlet dams to insure stable water levels during the spawning season was recommended for 5 of the lakes and the construction or replacement of dams for water level control, or for preventing fish movement out of a lake was advised in the case of 3 others.

Table I

Lakes of the Upper Peninsula of Michigan for Which Management Reports Have Been Written During the Period Extending From July 1, 1940 to June 30, 1941

County	Lake	Location			Year of survey	Report number	Date of report
		T. (N.)	R. (W.)	Sections			
Gogebic	Bass	45	39	9, 10, 15, 16	1937	630	11/14/40
"	Beatons	45, 46	40	Many	1937	"	"
"	Crooked	44, 45	40	Many	1938	"	"
"	Gogebic	46, 47, 48	42, 43	Many	1938	657	3/17/41
"	Imp	44	38	8, 9, 16, 17	1938	630	11/14/40
"	Marion	45	38	29, 30, 32	1938	"	"
"	Pilot	44	39	4, 5	1937	"	"
"	Sucker	45	39, 40	7, 12, 13	1938	"	"
"	Thousand Island	44	41	1, 2, 3, 10, 11, 12	1938	"	"
Houghton	Bob	49	37	2, 3, 10, 11	1937	"	"
"	Markey	52	36	13, 14, 23	1937	"	"
Iron	East Paint	46	37	36	1938	"	"
"	Five	43	36	5	1937	"	"
"	Golden	44	37	25, 26, 35, 36	1937	"	"
"	Hagerman	42, 43	36	2, 3, 10, 11, 34, 35	1938	"	"
"	Harding	46	37	23, 24, 25, 26	1937	"	"
"	Paint	46	37	25, 26, 36	1937	"	"
"	Pickrel	43	36	25, 26, 35, 36	1938	"	"
"	Robinson	46	37	27	1938	"	"
"	Seventeen	43	36	16, 17	1938	"	"
"	Sixteen	46	37	16, 21	1938	"	"
"	Smoky	43	37	21, 28, 32, 33	1938	"	"
"	Winslow	46	36	25, 26, 35, 36	1938	"	"
Marquette	Michigamme	47, 48	30, 31	Many	1938	604	7/ 2/40
"	Twin	45	30	23, 26	1940	658	3/19/41
Menominee	Bakers	35	28	19	1940	673	6/23/41
"	Bass	35	28	19	1940	"	"
"	Becker	35	28	18	1940	"	"
"	Dawn	36	28	4	1940	675	6/26/41
"	Linnbeck	36	28	26	1940	674	"
"	Long	35	28, 29	Many	1940	673	6/23/41
"	Sunset	36	28	4	1940	675	6/26/41
Ontonagon	Lake of the Clouds	51	43	22	1938	630	11/14/40

Table II

Lakes of the Upper Peninsula of Michigan For
Which Management Reports Have Been Written
During the Period Extending From
July 1, 1941 to January 1, 1942

County	Lake	Location			Year of survey	Report number	Date of report
		T. (N.)	R. (W.)	Sections			
Alger	Bass	44	20	25, 26, 35, 36	1937	713	12/16/41
"	Long	44	20	25, 26, 27	1937	"	"
Alger and Delta	Round	43, 44	19, 20	1, 6, 12, 36	1937	"	"
"	Stoner	43, 44	19, 20	2, 35	1937	"	"
Delta	Chicago	42	18	7, 13, 18	1937	707	12/ 5/41
"	Crane	42, 43	18	3, 4, 34	1937	"	"
Iron	Marten	46	35	8, 9, 16	1941	711	12/15/41
Keweenaw	Lac LaBelle	57, 58	29	3, 4, 5, 6, 31, 32, 33, 34	1941	717	12/18/41
Luce	North Manistique	45	11, 12	13, 18, 19	1936	702	11/11/41
Mackinac	Big Manistique	44, 45	11, 12	Many	1936	"	11/11/41
"	South Manistique	44	12	Many	1937	"	"
Menominee	Ann	35	28	3	1940	699	11/26/41
"	Mary	35	28	3	1940	"	"
Schoolcraft	Gulliver	41, 42	14	Many	1940	708	12/ 5/41

Table III

Lakes of the Upper Peninsula of Michigan Which Were
 Inventoried During the Period Extending From
 July 1, 1940 to June 30, 1941

County	Lake	Location			Date of completion of survey
		T. (N.)	R. (W.)	Sections	
Marquette	Airport	45	25	23	8/13/40
"	Chain of Lakes	45	29	28	7/31/40
"	Island	45	30	14	7/25/40
"	Sagola	45	28	5, 6	7/21/40
"	Swanzy	45	25	13	8/15/40
"	Twin	45	30	23, 26	8/ 7/40
Menominee	Ann	35	28	3	7/ 9/40
"	Bakers	35	28	19	7/ 3/40
"	Bass	35	28	19	7/ 3/40
"	Becker (part of Long Lake)	35	28	18	7/ 5/40
"	Dawn	36	28	4	8/23/40
"	Linnbeck	36	28	26	8/23/40
"	Long	35	28, 29	Many	7/ 5/40
"	Mary	35	28	3	7/ 9/40
"	Sunset	36	28	4	7/11/40

Table IV

Lakes of the Upper Peninsula of Michigan Which Were
 Inventoried During the Period Extending From
 July 1, 1941 to January 1, 1942

County	Lake	7 Location			Date of completion of survey
		6 T. (N.)	R. (W.)	14 Section	
Alger	Ackerman	45	20	3	8/ 8/41
Gogebic	Deadman's	46	39	36	8/26/41
Houghton	Ongie	53	35	19, 20, 29, 30	10/ 4/41
Iron	Marten	46	35	8, 9, 16	8/23/41
Keweenaw	Lac LaBelle	57, 58	29	Many	9/ 7/41
Luce	Holland	49	11	26, 27	8/11/41
Marquette	Sporley	45, 46	24	5, 31, 32	8/21/41
Ontonagon	Mirror	50	44	2	8/30/41
"	Moll	46, 47	38	2, 3, 34, 35	8/27/41

Table V

Summary of Management Proposals Appearing in Survey Reports
Written Between July 1, 1940 and June 30, 1941*

Lake	Area, acres	Change in designation	Stocking	Food increase	Shelter	water level
(Gogebic County)						
Bass	191	...	Adult northern pike	...	...	...
Beatons	330	...	Cisco, legal rainbows. Discontinue others.	...	...	...
Crooked	566	...	Brook trout	...	...	...
Gogebic	14,781	...	Forage fish, bluegills. No others for few years.	...	...	...
Imp	86	Trout	Cisco, adult rainbows. Discontinue others.	...	...	...
Marion	318	...	Discontinue	...	...	...
Pilot	23	Trout	Brook trout. Discontinue others.	Experimental fertilization	...	...
Sucker	439	...	Adult northern pike only.	...	...	...
Thousand Island	1,078	...	Only walleyes, alternate years.	...	...	...
(Houghton County)						
Bob	120	...	Discontinue	...	Brush shelters	...
Markey	46	...	Discontinue	Experimental fertilization	...	...

(Continued)

Table V

Summary of Management Proposals Appearing in Survey Reports
 Written Between July 1, 1940 and June 30, 1941

(Continued)

Lake	Area, acres	Change in designation	Stocking	Food increase	Shelter	Water level
(Iron County)						
East Point	147	...	Discontinue	...	...	...
Five	360	...	Forage fish. No other.	...	...	...
Golden	580	Trout	Cisco, rainbow trout. Discontinue others.	...	...	...
Hagerman	504	...	Discontinue	...	Brush shelters	...
Harding	36	...	Discontinue	...	...	...
Paint	332	...	Discontinue	...	...	Replace old dam in outlet.
Pickeral	551	Trout	Rainbow, legal size. Discontinue others.	...	...	...
Robinson	76	...	Discontinue	...	Brush shelters	...
Seventeen	156	...	Discontinue	...	...	...
Sixteen	70	...	Northern pike. Discontinue others.	...	...	...
Smoky	557	Trout	Lake trout, rainbows. No others.	...	...	...
Winslow	255	...	Discontinue	...	...	...
(Marquette County)						
Michiganme	4,360	...	Discontinue, except 9-12" lake trout.	...	Brush shelters	...
Twin	22	Trout	Rainbow trout fingerlings.	Experimental fertilization?	...	Small dam to pre- vent connection with Hogan Lake.

(Continued)

Table V

Summary of Management Proposals Appearing in Survey Reports
 Written Between July 1, 1940 and June 30, 1941
 (Continued)

Lake	Area, acres	Change in designation	Stocking	Food increase	Shelter	Water level
(Menominee County)						
Baker	24	...	Discontinue	...	...	Operate Long Lake dam.
Bass	85	...	Discontinue	...	...	Operate Long Lake dam.
Becker	Part of Long Lake	...	Discontinue	...	...	Operate Long Lake dam.
Dawn	2	...	Discontinue	...	...	...
Limbeck	4 $\frac{1}{2}$	Trout	Trout	...	...	...
Long	284	...	Discontinue	...	...	Operate dam.
Sunset	4	...	Discontinue	...	...	...
(Ontonagon County)						
Lake of the Clouds	133	...	Northern pike. No others.	...	...	...

* Taken in part from a summary prepared by C. Wood.

Table VI

A Summary of Management Proposals Appearing in Survey Reports
Written Between July 1, 1941 and January 1, 1942

Lake	Area, acres	Change in designation	Stocking	Food increase	Shelter	Water level
(Alger County)						
Bass	35	Pike	Discontinue	...	...	...
Long	314	Pike	Discontinue	...	...	...
(Alger and Delta Counties)						
Round	475	Pike	Discontinue	...	...	...
Stoner	72	...	Discontinue	Experimental fertilization	...	...
(Delta County)						
Chicago	188	Pike	Discontinue	...	...	...
Crane	115	Pike	Discontinue	...	...	...
(Iron County)						
Marten	176	...	Discontinue	...	...	...
(Keweenaw County)						
Lac LaBelle	1,146	...	Walleyes only, alternate years.	...	Brush	...
(Luce County)						
North Manistique	1,722	...	No walleyes or others during 1942 or 1943	...	...	...

(Continued)

Table VI

A Summary of Management Proposals Appearing in Survey Reports
 Written Between July 1, 1941 and January 1, 1942^{*}
 (Continued)

Lake	Area, acres	Change in designation	Stocking	Food increase	Shelter	Water level
(Mackinac County)						
Big Manistique	10,130	...	No walleyes or others during 1942 or 1943.	...	...	Dam
South Manistique	4,001	...	No walleyes or others during 1942 or 1943	...	...	Operate dam.
(Menominee County)						
Ann	21	...	Discontinue	...	...	...
Mary	35	...	Discontinue	...	...	...
(Schoolcraft County)						
Gulliver	836	...	No walleyes or others during 1942 or 1943.	...	...	...

* Taken in part from a summary prepared by G. Wood.

3.--The General Creel Census in the Upper Peninsula,
1939 and 1940

by

Louis A. Krumholz

The general creel census has been in operation in all parts of Michigan since 1927. This census is taken by the Conservation officers as an adjunct to their other duties, and is intended to be a means of gathering a random sample of all the fishing in the state. The number of fishermen interviewed, whether or not they caught fish, the number of hours spent in fishing, the number of legal fish taken and other pertinent data are gathered by these means. The records taken by the officers are sent to the Institute for Fisheries Research for tabulation and analysis.

Number of Records

In the Upper Peninsula the officers contacted 3,043 fishermen in 1939 and 2,698 in 1940. The figures for the 1941 census are not yet available. The 1939 records represent 9.4 per cent of all fishermen interviewed in the state and the 1940 figures represent 9.2 per cent. Of the total number of fishermen interviewed in these two years, 14.9 per cent were non-residents. This compares with an average of 15.1 per cent non-residents for the state as a whole, and suggests that Upper Peninsula waters are used by out-of-state anglers about as much as those in other parts of the state.

There were fewer than 100 reports from Keweenaw County in 1939 and from Keweenaw and Menominee Counties in 1940. We believe this reflects the relatively small number of fishing waters in these counties.

Trout and Non-Trout Fishing by Hatchery Districts

There are two hatchery districts in the Upper Peninsula. District 1, with headquarters at Watersmeet, includes Baraga, Coegebic, Houghton, Iron, Keweenaw and Ontonagon Counties. District 2, with headquarters at Thompson, includes Alger, Chippewa, Delta, Dickinson, Luce, Mackinac, Marquette, Menominee and Schoolcraft Counties.

In 1939, Hatchery Districts 1 and 2 ranked in first and second places, respectively, in the percentage of fishermen using trout waters in the state. In 1940 these same Districts ranked second and third, respectively, to District 7 (Mason, Lake, Osceola, Clare, Oceana, Newaygo, Mecosta, and Isabella Counties) in which 44.3 per cent of the anglers fished for trout. These percentages are given in Table I. If the number of creel census records secured are indicative of the total amount of fishing in the state, the two Upper Peninsula Hatchery Districts afforded 42.2 per cent of the trout fishing in the state in 1939 and 37.7 per cent in 1940. This amount of trout fishing is very high considering the rather sparse population of the Upper Peninsula.

Table I

	Hatchery District 1		Hatchery District 2	
	Trout	Non-trout	Trout	Non-trout
1939	45.4	54.6	39.5	60.5
1940	43.3	56.7	35.9	64.1

Quality of Fishing

As in other reports on the general creel census, the quality of fishing is indicated by the catch per hour. In 1939, the average catch per hour for the entire state on all waters was 1.1 fish. The catch of 1.1 fish per hour in District 2 is identical with the state average for that year. However, the catch of 0.6 fish per hour in District 1

is only half the state average. In 1940 the state average was 1.0 fish per hour. The fishing in District 2 was nearly half again as good (1.4 fish per hour), whereas the fishing in District 1 remained about the same as in 1939 (0.5 fish per hour).

In trout waters the state average was 0.8 fish per hour in 1939. In District 1 the catch per hour was identical with the state average but the average of 1.2 fish per hour in District 2 was 50 per cent higher. In 1940 the state average for trout waters was the same as in 1939 (0.8 fish per hour). Again the catch of 0.8 fish per hour in District 1 was identical with the state average, but the catch in District 2 dropped to 1.1 fish per hour.

In non-trout waters the state average in 1939 was 1.1 fish per hour. In District 1 the catch during 1939 was only 0.4 fish per hour, but in District 2 it was 1.1 fish per hour, or the same as the average for the entire state. In 1940, when the state average dropped to 1.0 fish per hour, the catch in District 1 was only 0.3 fish per hour, but the catch per hour in District 2 rose to 1.5 fish.

Thus the trout fishing in the Upper Peninsula is, as a whole, better than average for the entire state, whereas only in the western part of the Upper Peninsula is the non-trout fishing poorer than the state average. This may be partially explained by the abundance of good trout water in the Upper Peninsula, and the greater abundance of good non-trout waters in the eastern part of this area.

Number and Size of Trout--Trout Waters

The data collected by the general creel census show that the brook trout is by far the commonest trout taken in the Upper Peninsula. There are relatively more brown and rainbow trout caught south of the Straits

of Mackinac but this is nearly compensated for by the larger numbers of brook trout taken in the Upper Peninsula.

The brown and rainbow trout, not so common as the brook trout in the Upper Peninsula, made up only 20.3 and 18.9 per cent, respectively, of the state total reported for each kind in 1939. In 1940, these percentages dropped to 12.6 per cent for the brown trout and 3.4 per cent for the rainbow. Table II shows the total trout catch reported by creel census for the state for all trout and for each kind of trout, together with the percentage of the total state catch made up by Districts 1 and 2 in the Upper Peninsula, and the Lower Peninsula. It also shows the percentage of the trout catch made up by each species for each of these divisions and for the entire state.

Table II

	All trout		Brook trout		Brown trout			Rainbow trout		
	Number	Number	Per cent state catch	Per cent trout catch	Number	Per cent state catch	Per cent trout catch	Number	Per cent state catch	Per cent trout catch
					<u>1939</u>					
District 1	3,029	2,354	19.9	77.7	338	13.1	11.2	337	16.7	11.1
District 2	5,083	4,854	41.0	95.5	187	7.2	3.7	42	2.1	0.8
Lower Peninsula	8,346	4,645	39.1	55.7	2,058	79.7	24.6	1,643	81.2	19.7
Total	16,458	11,853	100.0	72.0	2,583	100.0	15.7	2,022	100.0	12.3
					<u>1940</u>					
District 1	2,710	2,457	25.0	90.7	227	9.9	8.3	26	1.4	1.0
District 2	4,062	3,956	40.3	97.4	70	2.7	1.7	36	2.0	0.9
Lower Peninsula	7,418	3,396	36.4	45.8	2,261	88.4	30.5	1,761	96.6	23.7
Total	14,190	9,809	100.0	69.1	2,558	100.0	18.0	1,823	100.0	12.9

The size of the brook trout taken in the Upper Peninsula (8.9 inches in both 1939 and 1940) was greater than the state average for either year (8.6 in 1939 and 8.7 in 1940). The brown trout taken in the Upper Peninsula were also larger (10.6 inches in 1939 and 9.8 inches in 1940) than the average for the entire state (9.9 inches in 1939 and 9.5 inches in 1940). In neither of these years were the rainbow trout (average length 10.4 inches in 1939 and 9.9 inches in 1940) as large as the average for the entire state (10.6 inches in 1939 and 10.4 inches in 1940). The fact that the rainbows were smaller than average in the Upper Peninsula should not be alarming, inasmuch as they made up less than 5 per cent of the total catch each year.

Composition of Catch--Non-Trout Waters

As in the other regions of the state, there are nine species of fish which make up the bulk of the catch in non-trout waters. These fish are the largemouth and smallmouth black bass, bluegill, pumpkinseed (common sunfish), crappie, rock bass, yellow perch, northern pike, and walleye. Table III shows the percentage composition of the anglers' catch for the Upper Peninsula and for the entire state for the two years 1939 and 1940.

Table III
Percentage Composition of the Anglers' Catch

	Upper Peninsula		Entire State	
	1939	1940	1939	1940
Bluegill	8.8	2.2	41.3	32.4
Yellow perch	46.5	51.9	22.2	28.3
Rock bass	5.7	7.3	6.9	7.6
Pumpkinseed	1.6	2.1	5.6	5.4
Black crappie	1.2	0.3	3.4	5.0
Northern pike	12.7	13.1	3.1	3.6
Smallmouth bass	5.8	5.6	2.4	2.8
Walleye	9.4	7.5	2.6	2.3
Largemouth bass	2.4	2.0	2.2	2.1
Other fish	5.9	8.0	10.3	10.5

The data in this table show that the percentage of yellow perch, walleye, smallmouth black bass, and northern pike in the anglers' catch is greater in the Upper Peninsula than in the state as a whole. The bluegill, which is so common in southern Michigan lakes does not do well in many of the waters of the Upper Peninsula, and for this reason it is not taken in great numbers by anglers north of the Straits of Mackinac.

Summary

1. The Upper Peninsula has supplied 9.3 per cent of the records for the general census during the two-year period. This is considered a fair number considering the relatively light fishing pressure on most waters.
2. The lakes and streams of the Upper Peninsula furnished approximately 40 per cent of the trout fishing reported in the state for the years 1939 and 1940.
3. The catch per hour of all fishing in the Upper Peninsula was slightly below the average for the state during 1939 and 1940.
4. The catch per hour of trout in the Upper Peninsula was considerably higher than the average for the state for the two-year period.
5. The catch per hour in non-trout waters was below the average in District 1 during both years, but in District 2 the fishing in non-trout waters was as good as the average for the state.
6. Nearly half of the trout reported in the general census for the entire state were caught from the waters of the Upper Peninsula.
7. The trout taken by anglers in the Upper Peninsula were larger than the average for the state both years, with the exception of the rainbow trout.

8. The larger game fishes, viz. smallmouth black bass, walleye and northern pike, as well as the yellow perch, made up a larger portion of the total catch in the Upper Peninsula than these species did of the total catch reported south of the Straits of Mackinac.

Table IV
General Census, Upper Peninsula
1939

District and County	No. of fishermen	No. taking no fish	Total hours fished	Legal fish taken	Catch per hour	No. of fishermen	No. taking no fish	Total hours fished	Legal fish taken	Catch per hour
			<u>TROUT WATERS</u>			<u>NON-TROUT WATERS</u>				
#1										
Baraga	406	181	1,328.25	1,337	1.0	180	65	1,010.00	358	0.4
Gogebic	248	156	1,069.00	292	0.3	481	219	2,018.25	866	0.4
Houghton	120	30	366.75	536	1.5	86	38	190.50	184	1.0
Iron	246	88	825.50	805	1.0	466	236	1,696.75	704	0.4
Keweenaw	26	6	107.50	113	1.1	31	14	165.00	34	0.2
Ontonagon	87	41	291.25	176	0.6	119	68	381.50	97	0.3
Total	1,133	502	3,988.25	3,259	0.8	1,363	640	5,462.00	2,243	0.4
#2										
Alger	174	22	781.25	916	1.2	104	12	350.00	323	0.9
Chippewa	116	38	427.75	522	1.2	396	138	1,263.00	1,838	1.5
Delta	123	29	495.00	360	0.7	557	226	1,916.50	1,399	0.7
Dickinson	93	3	394.75	498	1.3	17	2	62.00	81	1.3
Luce	196	43	764.75	973	1.3	219	76	893.00	877	1.0
Mackinac	61	20	210.75	201	1.0	135	21	556.00	798	1.4
Marquette	179	35	768.75	814	1.1	148	29	424.75	458	1.1
Menominee	156	42	439.00	514	1.2	27	9	95.00	59	0.6
Schoolcraft	104	14	381.00	584	1.5	238	83	579.75	725	1.3
Total	1,202	246	4,663.00	5,382	1.2	1,841	596	6,140.00	6,558	1.1
			<u>ALL WATERS</u>							
#1										
Baraga	586	246	2,338.25	1,695	0.7					
Gogebic	729	375	3,087.25	1,158	0.4					
Houghton	206	68	557.25	720	1.3					
Iron	712	324	2,522.25	1,509	0.6					
Keweenaw	57	20	272.50	147	0.5					
Ontonagon	206	109	672.75	273	0.4					
Total	2,496	1,142	9,450.25	5,502	0.6					
#2										
Alger	278	34	1,131.25	1,239	1.1					
Chippewa	512	176	1,690.75	2,360	1.4					
Delta	680	255	2,411.50	1,759	0.7					
Dickinson	110	5	456.75	579	1.3					
Luce	415	119	1,657.75	1,850	1.1					
Mackinac	196	41	766.75	999	1.3					
Marquette	327	64	1,193.50	1,272	1.1					
Menominee	183	51	534.00	573	1.1					
Schoolcraft	342	97	960.75	1,309	1.4					
Total	3,043	842	10,803.00	11,940	1.1					

Table V
General Census, Upper Peninsula
1940

District and County	No. of fishermen	No. taking no fish	Total hours fished	Legal fish taken	Catch per hour	No. of fishermen	No. taking no fish	Total hours fished	Legal fish taken	Catch per hour
<u>TROUT WATERS</u>						<u>NON-TROUT WATERS</u>				
#1										
Baraga	92	16	365.00	364	1.0	363	134	2,503.00	630	0.3
Gogebic	106	50	391.50	284	0.7	233	89	1,036.00	496	0.5
Houghton	280	124	929.75	709	0.8	199	105	730.75	246	0.4
Iron	241	88	1,136.75	792	0.7	335	128	1,477.50	631	0.4
Keweenaw	65	23	243.00	294	1.2	8	1	64.50	30	0.4
Ontonagon	150	32	662.00	373	0.6	67	49	410.50	93	0.2
Total	934	333	3,728.00	2,816	0.8	1,225	506	6,242.25	2,126	0.3
#2										
Alger	126	50	477.75	549	1.2	31	11	175.50	94	0.5
Chippewa	153	21	550.50	910	1.7	793	87	2,150.00	4,606	2.1
Delta	106	40	291.00	264	0.9	173	76	453.25	722	1.6
Dickinson	61	25	242.75	171	0.7	60	23	168.00	179	1.1
Luce	163	26	718.75	1,048	1.5	228	64	820.00	1,061	1.3
Mackinac	53	15	178.25	172	1.0	220	75	679.75	815	1.2
Marquette	153	48	760.25	513	0.7	102	25	479.75	328	0.7
Menominee	86	43	252.50	171	0.7	11	7	40.00	9	0.2
Schoolcraft	68	12	262.25	389	1.5	111	59	233.00	144	0.6
Total	969	280	3,734.00	4,187	1.1	1,729	427	5,199.25	7,958	1.5
<u>ALL WATERS</u>										
#1										
Baraga	455	150	2,868.00	994	0.3					
Gogebic	339	139	1,427.50	780	0.5					
Houghton	479	229	1,660.50	955	0.6					
Iron	576	216	2,614.25	1,423	0.5					
Keweenaw	73	24	327.50	324	1.0					
Ontonagon	237	81	1,072.50	466	0.4					
Total	2,159	839	9,970.25	4,942	0.5					
#2										
Alger	157	61	653.25	643	1.0					
Chippewa	946	108	2,700.50	5,516	2.0					
Delta	279	116	744.25	986	1.3					
Dickinson	121	48	410.75	350	0.9					
Luce	391	90	1,538.75	2,109	1.4					
Mackinac	273	90	858.00	987	1.2					
Marquette	255	73	1,240.00	841	0.7					
Menominee	97	50	292.50	180	0.6					
Schoolcraft	179	71	495.25	533	1.1					
Total	2,698	707	8,933.25	12,145	1.4					

4.--The Intensive Creel Census On Lake Gogebic,
Ontonagon and Gogebic Counties,

1940 and 1941

by

Louis A. Krumholz

The creel census on Lake Gogebic was started May 15, 1940, under the immediate supervision of Richard Bohland. The period of census extended through October 26, 1940. In 1941, the census was under the supervision of Dexter Reynolds. The census started April 26, 1941, and extended through October 10. The reason that the census was started before the opening of the pike season in 1941 was the heavy fishing pressure reported near the mouth of the Slate River (the main outlet of Lake Gogebic). This is trout water and a census of the pike and walleyes taken from this area was considered desirable in order to learn whether the take there might be large enough to affect the fishing in Lake Gogebic.

During each of the two seasons it has been estimated that about 80 - 85 per cent of the anglers on Lake Gogebic reported their catch either directly to the census taker or to one of the several boat liverymen around the lake who volunteered their services. Excellent assistance in securing these creel census records was also given by the Division of Field Administration of District 1.

Number of Records

In 1940 there were 2,276 fishermen whose catch was reported. In 1941 this figure was more than doubled when the catches of 5,556 fishermen were reported by the census clerk. During 1940, 250 (11.0 per cent) were women and during 1941, 663 (11.9 per cent) were women. During the first

of the two seasons there were relatively fewer fishermen "blanked" (987, or 13.4 per cent of the anglers caught no fish) than during 1941, when 3,167 (57.0 per cent) of the fishermen went home empty-handed.

Time Spent Fishing

Both of the censuses on Lake Gogebic extended over a period of between 23 and 24 weeks. During the 1940 season the 2,276 fishermen reported on the lake spent 8,050.75 hours (3.5 hours per man day) in fishing, whereas during the 1941 census the 5,556 fishermen reported fished 18,176.75 hours (3.3 hours per man day) in fishing.

At the present time there is no explanation why the fishing pressure in 1941 should have been nearly two and a half times as great as in 1940.

Quality of Fishing

The number of fish taken each hour of fishing is one of the common means of estimating the quality of fishing. During the 1940 season, the fishermen caught 2,917 fish at a rate of 0.36 fish per hour. This is slightly better than in 1941 when 5,703 fish were taken at a rate of 0.31 fish per hour.

Another method of estimating the quality of fishing is the number of fish taken by each angler. In 1940 the catch per fisherman was 1.28, whereas in 1941 the individual catch dropped to 1.03 fish.

Composition of the Catch

The commonest fish in the catch for each of the two years was the walleye. This fish made up more than four-fifths of the total catch each of the two years. Other fish taken in their order of abundance were the northern pike, smallmouth bass, yellow perch and black crappie. The yellow perch ranked higher than the smallmouth in 1941. Table I shows the numbers of each fish taken by the anglers as shown by the census and also the percentage composition of the catch for each of the two years.

Table I

Walleye		Northern pike		Smallmouth bass		Yellow perch		Black crappie	
No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
<u>1940</u>									
2,539	30.9	345	11.8	72	2.5	71	2.4	31	1.1
<u>1941</u>									
4,921	36.3	451	7.9	62	1.1	109	1.9	33	0.6

In each of the two seasons these six kinds of fish made up the great majority of the catch.

It is of interest to note that the walleyes are evidently maintaining themselves in Lake Gogebic under heavy fishing pressure. In 1941, more than twice as many walleyes were taken from Lake Gogebic than in 1940. That the walleye does spawn successfully in Lake Gogebic has been shown by Paul H. Eschmeyer of the Institute for Fisheries Research (Report No. 695).

In conclusion it may be said that the fishing in Gogebic Lake has remained about the same for a two-year period. The catch per hour, although not as high as the average for the state, would probably compare very favorably with that of other large "pike lakes" in the state. The catch per hour is never as high in fishing for bass, walleyes and pike as for panfish, but the total poundage of fish taken by either type of fishing would probably be comparable.

5.--Summary of Institute for Fisheries Research
Report No. 695, "Notes on the Natural Reproduction
of the Walleyed Pike in Lake Gogebic"

by

Paul Eschmeyer

A knowledge of the life histories of individual species of fish is highly important in fish management. Each species, to successfully perpetuate itself in any given water, must have suitable food, shelter and opportunity for successful reproduction. What constitutes food, shelter, or spawning habitat for one species frequently does not fulfill the needs of others. Unless the fisheries worker knows the various requirements and habits of the species which he attempts to manage, he is unable to determine the suitability of a given water for a given species of fish, almost irrespective of the amount of other detailed physical, chemical or biological data which he may gather in the field.

The walleyed pike is among the highly important food and game fishes of Michigan whose life history has never been completely worked out. References in the scientific literature to the spawning habitat and growth of this species are very scant, and in recent years it has become increasingly evident that further information concerning the habits of walleyed pike would be highly desirable, to insure its proper management in the waters in which it occurs, or where its introduction is being considered.

One of the principal waters of Michigan in which walleyes dominate the fish population is Lake Gogebic. The abundance of this species in Lake Gogebic, the relative clearness of the water (permitting easy observation of fish activity in the shoal areas), and the proximity of the lake

to the District Fisheries Biologist's headquarters at Watersmeet combined to make possible a rather detailed study of some parts of the life history of the walleyed pike during the spring and summer of 1941. A summary of the principal findings follows:

1. The spawning period of the walleyed pike in Lake Gogebic in 1941 was found to extend at least from April 25 to May 19. The closed season therefore protects quite well the walleyes during spawning.

2. Water temperatures in the shoal areas during the spawning period ranged from 39.5° to 54.5°F. Spawning activity reached its greatest intensity while the temperature of the water ranged from 47° to 48°F.

3. Walleyes in Lake Gogebic appear to spawn only on the shoal areas along the east shore of the lake. This shore has a gradual declivity from the shore to deeper water, and has a rubble bottom type. Between the rounded boulders is found coarse gravel, underlain with finer gravel and sand. The portion of the shoals used by the walleyes is exposed to the prevailing wind and the rubble is kept washed clean by almost constant wind action.

4. At the time of spawning, walleyes congregate into groups of from 3 to 15 or more individuals and mill about in shallow water. Two or more fish may participate in an individual spawning act. Eggs are broadcast over the shoal areas.

5. Walleyes in Lake Gogebic apparently spawn only at night.

6. Along a mile of shoreline, 862 adult walleyes were seen on the night of May 1, while 1,016 were counted on May 3 along the same mile of shoreline.

7. Eyed eggs, about to hatch, were first collected on May 10. Freshly laid eggs were collected as late as May 19.

3. Based on collections made at Lake Gogebic, the growth of walleyes there was as shown in the following table. The approximate average date of hatching is arbitrarily set at May 15. The number of fish upon which the measurements are based are also given.

Date	Approximate no. of days after hatching	Number of specimens	Average total length (inches)	Average weight (ounces)
June 25	41	2	1 1/8	0.02
July 10	56	21	2 5/8	0.09
August 2	79	37	5 1/8	0.35
October 18	126	10	6 3/8	1.14

6.--Restoration of Trout Lakes

by

Louis A. Krumholz

July 1, 1940 - July 1, 1941

1. Airport Lake, Marquette County.

Airport Lake was surveyed August 12 and 13, 1940 (see Survey Section of Report) and found suitable for trout if the stunted perch were removed. The existing fish population was eliminated August 20-23, 1940. This work was done by members of the staff of the Institute for Fisheries Research. Only two species, stunted yellow perch and a few starved brook trout, were taken in the treatment. This lake had been stocked with 2,500 9-month-old brook trout in November, 1938, but apparently results were poor because of the heavy competition from the large population of yellow perch.

The lake was stocked with 1,100 brook trout 6-7 inches long on May 15, 1941, and again on September 25, 1941, with 3,000 brook trout averaging 4-5 inches in length.

The lake was visited by members of the Institute for Fisheries Research October 6, 1941. One gill net set over night yielded 28 brook trout averaging 10.1 inches in length and 0.4 pounds in weight. No other fish were taken in the net. This catch indicates that the brook trout planted in this lake are growing very rapidly, apparently without any other fish as forage.

2. Linnbeck Lake, Menominee County.

A survey of this lake August 22, 1940, indicated that the lake would make a suitable habitat for trout, except for the presence of warm-water fish which were not furnishing any desirable angling.

The existing fish population was eliminated by chemicals September 11-13, 1940. Five species of game fish and eleven kinds of forage fish were present. A brush filter dam was placed at the outlet to prevent the repopulation of the lake by undesirable species.

Linnbeck Lake was stocked with 500 brook trout averaging 8-10 inches in length on May 8, 1941, and again on October 17, 1941, 3,000 brook trout 4-5 inches in length were planted. There had been no other planting in this lake for the 6 years preceding the elimination of the population.

3. Swanzy Lake, Marquette County.

Swanzy Lake was surveyed August 11-14, 1940, and was determined suitable for trout. Since lakes cold enough for trout usually do not furnish good fishing for warm-water species, the survey results probably explain the failure of plantings of bass and bluegills made in 1937.

A party from the Institute for Fisheries Research treated the lake with chemical September 14-16, 1940, to eliminate the existing fish population. Yellow perch, largemouth black bass, bluegills, and golden shiners were taken in the treatment.

A planting of 1,200 brook trout averaging 6-7 inches in length was made on May 14, 1941. Further plantings of 4,000 4-5 inch brook trout on September 25, 1941, and 1,000 8-10 inch brook trout on October 8, 1941, were made.

On October 7, 1941, when a check in the growth of these fish was made by members of the Institute for Fisheries Research, the fish from the planting on May 14, 1941, had attained an average length of 11.7 inches and averaged 0.7 pounds in weight. These fish had grown to this large size without any other fish as forage.

July 1, 1941 to January 1, 1942

4. Witch Twin Lake, Marquette County.

Witch Twin Lake has a maximum depth of 90 feet. It was surveyed by the Institute for Fisheries Research August 5-7, 1940, and was found to be suitable for trout.

The existing stunted fish population was eliminated by the use of chemicals July 23-27, 1941, by the Institute for Fisheries Research. Yellow perch, largemouth bass, golden shiners and mudminnows were taken during the treatment. The lake was checked in October to make sure that the chemical had lost its toxicity and that no fish remained in the lake.

On October 28, 1941, a planting of 3,000 fingerling rainbow trout was placed in Witch Twin Lake. It is reported by Conservation Officer Edward Morris that, due to unusually heavy rains during the autumn of 1941 the level of Witch Twin Lake raised to a point where it flowed into Hogan Lake. This may cause a restocking of Witch Twin Lake with perch, bass, etc., from Hogan Lake.

5. Holland Lake, Luce County.

Holland Lake was surveyed August 8-10, 1941, by members of the staff of the Institute for Fisheries Research.

Holland Lake has a reputation of being a good trout lake a few years ago, but the catches of trout in recent years had become progressively poorer. From 1934 through 1940, about 30,000 brook trout averaging 8 months in age were planted in the lake. The survey revealed large numbers of stunted pumpkinseed sunfish in the lake and only few trout.

The fish population was eliminated by the use of chemicals September 10-15, 1941, by the Institute for Fisheries Research. Of the 30,000 trout planted in the last seven years, only 86 were taken during the treatment. Apparently many of these fingerlings failed to survive, although good to increasingly poor fishing resulted from the plantings. One yellow perch and about 12,000 pumpkinseeds, together with 550 suckers and 12 different kinds of forage fish numbering about 30,000 individuals were also taken.

The lake was checked on October 4, 1941, to be sure no fish remained alive and that the chemical had dissipated itself. On October 20, 1940, 200 legal brook trout weighing one pound each and 2,000 fingerlings were planted in the lake.

There are several important things to be noted on these lakes:

1. Five lakes in the Upper Peninsula have been cleaned out and restocked with trout during the period covered by this report.
2. All the fish for restocking were supplied by the state fish hatcheries of the Department of Conservation.
3. All these lakes have been designated as trout waters by the Department of Conservation. The open season for angling extends from the last Saturday in April through Labor Day.

4. The use of live minnows or other kinds of fish as bait is prohibited in these lakes to prevent repopulation with undesirable species.

5. Five lakes in which the fishing was reputedly poor have been transformed into trout lakes. The total area of water rehabilitated by this method during the period covered by this report is approximately 59 acres. It seems likely that there may be a number of other lakes in the Upper Peninsula which have trout possibilities, but surveys are necessary to locate them as many lakes which are deep and cold lack oxygen or are otherwise incapable of supporting trout.

7.--Trout Stream Census and Legal-sized Planting Experiment

by

David S. Shetter

During the 1940 trout season, short sections of two streams were under intensive creel census through the cooperation of the United States Forest Service. The streams were the Fishdam River in Delta County, and the East Branch of the Tahquamenon River in Chippewa County.

On the East Branch of the Tahquamenon River, where about 3 miles of stream was closely checked, 259 fishermen spent 647.50 hours in angling and caught 660 legal brook trout for a catch per hour of 1.02 legal trout, which is exceptionally high for trout stream angling when compared with similar censuses for previous years on the better trout streams of the Lower Peninsula.

On the East Branch of the Tahquamenon River, part of the catch consisted of tagged hatchery brook trout which were released on June 28, 1940. Two hundred and fifty tagged fish were planted, and 132, or 52.3

per cent, were retaken during 1940. Four tagged fish were also reported by anglers during the 1941 season. These results from the tagging experiment were comparable to results noted in Lower Peninsula brook trout planting experiments. The total poundage of fish removed from this section of the East Branch of the Tahquamenon River was approximately 180 pounds, including the hatchery fish. Excluding the weight of the hatchery fish taken, the yield was approximately 25 pounds per acre for the 6 1/4 acres under intensive creel census.

The Fishdam River was fished by 299 anglers who spent 589.50 hours on about one mile of stream and caught 446 legal brook trout and 25 legal brown trout at the rate of 0.80 fish per hour. The total weight of fish removed by the anglers consisted of 188.4 pounds of brook trout and 16.5 pounds of brown trout. As about 3 acres of stream were under census, the yield may be estimated to be about 68.3 pounds of fish per acre of stream.

3.--Brief Summary of the Operation of a Fish Weir at the Outlet
of Lake Gogebic, during 1940 and 1941

by

Paul Eschmeyer

During the course of the past several years, sportsmen and resort operators in the vicinity of Lake Gogebic have repeatedly expressed the belief that large numbers of game fish (particularly walleyes) have been migrating down the outlet of Lake Gogebic each year without returning. It is not known that any factual information has ever been obtained to substantiate this belief, although it appears to have been widely held.

Suggestions for preventing the supposed depletion of game fish from Lake Gogebic by migration down the outlet began to appear, and in 1939 the Lake Gogebic Development Association, backed by the Ontonagon County Board of Supervisors, petitioned the Conservation Department for "authority and cooperation in determining and erecting the proper type of screen to be placed at the outlet of Lake Gogebic". Persistent requests for such a screen, by various interested groups and individuals, led to a special study of the problem by the Department of Conservation during 1940 and 1941. A counting weir was erected across the outlet of Lake Gogebic, constructed in such a manner as to trap in separate enclosures fish going downstream and fish coming upstream. The weir was placed just north of the Duluth, South Shore and Atlantic Railroad bridge which spans the outlet about 1/4 mile below the lake. C.C.C. labor was provided by the United States Forest Service to assist in building the structure. The weir received the daily attention of an operator, employed by the Department, from April 11, 1940 to September 15, 1941. A daily record of the numbers and species of fish traveling upstream or downstream was kept, and the fish were permitted to continue in the direction in which they were headed at the time of capture.

Although the weir was in continuous effective operation from April 11, 1940 to April 15, 1941, an interruption occurred immediately after the latter date. High water levels accompanying the spring break-up brought several large logs down the outlet which broke through the center of the weir. It was repaired within 3 days, but the depth and rather dark brown color of the water prevented an inspection of the lower portions of the weir before May 11. At this time the weir was found to have several small openings through which fish might have passed, and repairs were completed.

The structure cannot be considered as having been effective during the period from April 16 to May 11, 1941. Since this is the period when the greatest movement of fish occurred during 1940, the relatively small number of fish taken in 1941 is explained. It is believed that results obtained during the remainder of the period during which the weir was in use, including the spring run of 1940, are not open to question.

A record of the numbers and species of fish passing through the Gogebic weir during the period extending from April 11, 1940 to December 31, 1940, and from January 1, 1941 to September 15, 1941, is shown in Tables I and II.

Table I

A Monthly Summary of Fish Movement Through
Gogebic Weir in 1940*

Month	Common sucker	Halleys pike	Northern pike	Calico bass	Perch	Rock bass	Smallmouth bass
<u>A. Fish Moving Downstream</u>							
April	398	17	7	1	...	...	...
May	15	35	...	6	2	3	3
June	2	3	1	...	...	10	...
July	...	...	...	...	...	...	...
August	2	...	...	...	...	...	...
September	...	...	1	...	...	...	...
October	...	1	...	...	...	...	...
November	...	...	1	...	...	...	...
December	...	...	...	...	...	...	...
Totals	417	56	10	7	2	13	3
<u>B. Fish Moving Upstream</u>							
April	72	13	4	1	1	1	...
May	49	2	...	...	1	...	...
June	24	3	...	...	...	28	2
July	10	11	5	1	...	21	...
August	8	5	...	...	1	4	...
September	...	10	...	...	...	1	...
October	...	1	1	...	...	...	...
November	...	...	1	...	...	...	...
December	...	...	...	...	...	...	...
Totals	163	45	11	2	3	55	2

* Summarized from daily records by Fenton Carbine.

Table II

A Monthly Summary of Fish Movement
Through Gogebic Weir, 1941

Month	Buckers	Walleyes	Northern pike	Crappies	Perch	Rock bass	Smallmouth bass	Largemouth bass
<u>A. Downstream Trap</u>								
January	...	...	...	...	...	...	...	...
February	...	...	...	...	...	...	...	...
March	...	...	...	...	...	...	...	...
April	1	...	3	...	...	...	1	1
May	2	...	...	...	...	...	...	...
June	...	...	...	...	...	...	...	...
July	...	...	...	...	...	...	...	...
August	...	...	...	...	...	...	...	...
September	...	...	...	...	...	...	...	...
Totals	3	...	3	...	...	...	1	1
<u>B. Upstream Trap</u>								
January	...	...	...	...	...	...	...	...
February	...	...	...	...	...	...	...	...
March	...	...	...	...	...	...	...	...
April	1	1	...	...	...	...	...	...
May	4	2	...	...	1	3	...	...
June	...	...	3	...	...	...	...	...
July	1	5	1	...	1	2	...	...
August	...	...	...	...	...	...	...	...
September	...	...	...	...	...	...	...	...
Totals	6	8	4	...	2	5	...	...

The tables show that the common sucker is the principal species which migrates down the Ontonagon River outlet of Gogebic Lake. The difference between the numbers of game fish going upstream and those going downstream is not significant. If all game species are combined, a total of 113 fish (other than suckers) entered the lake during 1940, as compared with 91 which left. Although more walleyes than any other game species were "lost" to the lake during 1940, a discrepancy of only 11 fish appears between those entering and those leaving. In 1941, in the months during which the weir was operating effectively, more fish of all species (except largemouth and smallmouth bass, of which species only one individual was taken) entered the lake than were removed from it by downstream migration.

The investigation clearly showed that there is no need for a screen across the outlet of Lake Gogebic to prevent the loss of adult game fish.

INSTITUTE FOR FISHERIES RESEARCH

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