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Mr. C. Lydell - 12-29-42
Holland Fish and Game Club
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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. 833

A FISHERIES SURVEY OF LAKE MACATAWA, OTTAWA COUNTY

by

C. J. D. Brown and Stanley Lievense

Introduction

Location and Drainage

Lake Macatawa, formerly known as Black Lake, is situated in the extreme southwest corner of Ottawa County (T. 5 N., R. 15 W., Secs. 29, 30, 31; T. 5 N., R. 16 W., Secs. 25, 26, 27, 33, 34, 35, 36). It appears as a broadening of the Black River near its mouth. As a matter of fact this lake is less than $\frac{1}{2}$ mile, at its west end, from Lake Michigan, into which the Black River flows.

The city of Holland is located near the east end of Lake Macatawa and good roads skirt the entire shore with many places of direct access.

Acknowledgments

The map used as a basis for the fisheries inventory was copied directly from the revised War Department map of this lake prepared in 1941. Certain check soundings were made by an Institute party* during the winter of 1941-1942.

We wish to acknowledge the fine cooperation of Mr. C. DeWaard and other members of the Holland Fish and Game Club. Considerable information and assistance was rendered the survey party by members of this organization. We also wish to thank Mr. Harry Nies for camping facilities furnished the party while on this lake.

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*The winter mapping party included: Robert Matthews, leader; Paul Scears and James Oliver, assistants.

The fisheries inventory* was made in June (2-13), 1942 and the data collected are used as a basis for this report.

Past and Present Use

Macatawa Lake has long served as a port for shipping. Cargo ships with a draft no greater than 15 feet can negotiate the dredged outlet channel and enter Lake Macatawa from Lake Michigan. At the present writing shipping is rather heavy. Numerous factories and warehouses have been built along the shores. The number of these is greater at the east end within the city limits of Holland. Other developments around the lake include approximately 300 cottages, two hotels, five resorts and ten boat liveries.

Holland State Park is located at the extreme west end and a small city park is on the Black River only a short distance from where it enters the lake. Kollens Park is owned by the City of Holland and is situated about 1 mile west of the mouth of the Black River on the south shore of the lake. A parcel of land was purchased recently to afford better public access. This is located to the west of the most northerly point of Big Bay. A considerable number of township and county roads terminate at the lake and these also afford some public access.

About ten years ago Lake Macatawa had the reputation of being the best largemouth bass lake in Michigan. According to reports this fishing has declined greatly. Perch and bluegills have likewise been taken regularly by anglers. A better history of fishing and conditions in general is given by Mr. C. De Waard in a letter to Mr. Locke, the Institute party leader. The letter follows:

"June 16, 1942

"A Brief Summary of L. M. Bass Fishing for Lake Macatawa, Ottawa Co.

"My Dear Mr. Locke, In reviewing the past 10 yr's of Bass fishing for this Lake, it is quite obvious that my observations and opinions must naturally be along quite general lines, I am very safe in stateing that our bass fishing, has over this period of time been, above the average of other lakes in this part of the State, although it is true here as in all lakes that each year is not equally good as regards number of fish taken. Naturally in looking back, I can remember some of the good years, and also some of the poorer ones, but taking everything into consideration our bass fishing has been very good untill 2 years ago I noticed a decline which also continued thru last year; this may be due to a natural cycle or not, we of course do not know, but we have gone thru similar declines before, and our bass fishing has always returned to normal, however since the extensive dredging operations carried on in our Lake about five years ago, compels us to believe that this has been responsible to

*The fisheries inventory party included: F. E. Locke, leader; R. D. Van Deusen, Pat Galvin and Stanley Lievense, assistants.

a big extent for some of the phenomena we find in our lake today, such as disappearance of weed beds excessive deposits of silt and inert matter covering some of our good spawning areas, and also changing to some extent the contour of the bottom. Noticeable in the fact that certain areas that formally produced good fishing seemed barren of fish, where other places which seldom produced fish seemed somewhat improved. The last real good bass fishing as I recall was in 1939, and that year was a very good one, on the opening morning of that year, myself and four others took our limit of 25 large mouth bass in less than 2 hr's of fishing, and I recall that I took limit catches on nine consecutive trips in that year, and many other fisherman, I am convinced had luck comparable to mine, however while these fish were in very good condition, a year later when some specimens were sent to The Institute of Fisheries Research for examination they were found to be in very poor condition, and report Signed by Allison and Moffat stated a heavy Coating of Mucus on the fish, White livers, and a Congestion of the Blood in the anterior, however whether there was a high mortality we have no way of knowing. but we are hopeful and optimistic, because last fall the fish taken, altho not examined mimutly by your institute, appeared to be in good condition again, very lively and minus fungus, which also appeared on these fish in 1939. For the past five years we have been stocking Lake Macatawa with approximatly 6 or 7 thousand small mouth bass yearly in addition to our regular heavy stocking of Large mouth bass and Bluegills, these fish are reared in our own rearing ponds and are planted under supervision of Mr. Claud Lydell from Comstock Park Hatcheries, the size of these Bass when planted average perhaps about 5 to 6 in. however to date we have seen very few small mouth bass taken from our lake, we think perhaps they migrate to some more suitable place via Lake Michigan, but of course this is only theory. We have stocked this lake with Large mouth Bass and Bluegills from our rearing ponds since about 1929. About 15 years ago we had a period of a few years, when fisherman made fine catches of small mouth bass, but the only place they could be caught was between the piers of the Channel going into Lake Michigan where the current was quite fast, they would often be in large schools, and they fed very near the surface on large minnows. but in recent years very few have been taken. In closing, let me say that I think from the stand point of good bass fishing, even considering the poorer years, our Lake has been far above the average in the number of fish taken, altho I will admit that some lakes produce much larger bass, few bass are taken that exceed 3 or $3\frac{1}{2}$ pounds from our lake, the average weight would be perhaps about 2 pounds or a little more.

"Thanking you for the interest shown in our Lake I remain

Resp'y yours

C. De Waard
Pres. Holland Fish and Game Club"

Aside from fishing the lake is much used for commercial shipping and pleasure craft as well as for swimming.

Physical Characteristics

Geological Origin

We have found no information on the geological origin of Lake Macatawa but there can be little doubt but that some of its early history was of a glacial nature. The lake is situated in an outwash plain with rather high moraines immediately to the south.

Shape of the Basin and Extent of the Drainage

Lake Macatawa is linear in shape. Its long axis extends approximately 5 miles in an east-northeast, west-southwest direction. The average width is much less than a mile. Two prominent triangular embayments extend from the north side. Except for these irregularities the outline of this lake is very regular. The immediate shores have a gradual sandy slope. These are partially wooded except in the commercial areas. The surrounding country is slightly rolling with sand and gravelly soil. Small areas of muck occur in low ground particularly along the streams. About half of the land is under cultivation and the remainder is partially wooded. The drainage area, which is essentially that of the Black River, includes approximately 150 square miles to the east and south of the lake. Pine Creek drains the area immediately north of the lake.

Water Fluctuation

There is no appreciable water fluctuation in Lake Macatawa. The Black River is the most substantial inlet. This stream is about 70 feet in width and had a depth of 3-8 feet near its mouth. It had a very slow current, hardly noticeable. Pine Creek, a tributary emptying into Pine Creek Bay is 25-40 feet wide at its mouth. This stream was very shallow and practically without current at the time of the survey. The outlet is essentially a dredged canal about 200 feet in width and with a uniform depth of about 20 feet. The water fluctuations most noticeable in the lake are those reflected from changes in the level of Lake Michigan. A seiche in Lake Michigan in the vicinity of this lake either raises or lowers the water level in a progressive sort of way the full length of the lake and may affect the Black River for two or three miles above the lake.

There are no obstructions in the outlet so that the level of Lake Macatawa is more or less the same as that of Lake Michigan.

Other Physical Data

Lake Macatawa has a surface area of 1780 acres and a maximum depth of 40 feet. About 40% of the water area is less than 5 feet deep. Only one depression still remains in the lake and the center of this is near the south shore about a mile from the west end. This small depression has been filled considerably within the past ten years due mainly to its use as a dumping ground for dredgings conducted by the War

Department. The lake bottom in the shoal areas is composed primarily of sand, sandy-silt and small amounts of fibrous peat. In the deeper water (over 12 ft.) the bottom is mostly muck and detritus.

The shore line of this lake is $2\frac{1}{2}$ times longer than it would be if the lake were perfectly round and of the same area. This shore line development is somewhat above the average for inland lakes and is an indication of potentially high productivity because as a general rule the greater the shore line development the greater the plant beds and feeding grounds for fish.

The water of Lake Macatawa is light brown in color and definitely turbid. The turbidity in this lake (secchi disc 2-5 ft.—average of all lakes studied 10.6 ft.) is definitely a limiting factor in fish production because it precludes the maximum growth of vegetation and the suspended matter deposits on and destroys fish spawning areas.

Wave and Ice Action

No serious biological effects were reported which might have been the result of wave or ice action. It is believed that under ordinary circumstances these factors are not of a serious nature.

With the exception of the high turbidity, Lake Macatawa has very favorable physical characteristics for fish production. The extensive shallow areas with rich bottom soils, good spawning grounds, as well as the large size of the lake are very favorable for the production of largemouth bass and bluegills.

Temperature and Chemical Characteristics

Temperature and chemical analyses were made on Lake Macatawa during the first two weeks of June by the regular inventory party. A summary of the data taken is given in the following table. (See table on p. 6)

Surface temperatures varied from 70°-75° F. at different points on the lake. The bottom water at 21 feet was 64° F. and at 30 feet, 60° F. No clear cut thermal stratification was found although a thermocline (zone of rapid change in temperature) was discovered between 12 and 18 feet in the turning basin at the east end of the lake. It is seriously doubted that this thermocline would be able to survive the summer. More or less uniform temperature conditions would be expected in this lake due to its shallow basin and the rather large quantity of water flowing through it. Water movement by wind and stream currents would be expected to keep the lake pretty well mixed.

Likewise oxygen conditions throughout the summer season would be expected to vary only slightly from top to bottom due to the same factors mentioned above. Adequate if not abundant dissolved oxygen was found in every sample studied by the survey. It is possible that during late summer there is some oxygen depletion close to the bottom in the deeper parts of the lake. This should never be of a serious nature however.

Temperature and Chemistry Data Taken on Lake Macatawa June 4-12, 1942

Station No.	1	2	3	4	5	6	7
Location	Station at U.S. 31 bridge on Black River	Station in central part of Pine Bay	Station in depression off Virginia Park	Station at a point two miles up Black River just above high tide level	Station in turning basin in east end of lake	Station at mouth of Pine Creek	Water sample from the outlet of dye works
Date	6/4/42	6/5/42	6/8/42	6/11/42	6/11/42	6/12/42	6/11/42
Time	11:00 A.M.	4:30 P.M.	4:30 P.M.	1:30 P.M.	4:00 P.M.	9:00 P.M.	12:00 A.M.
Air temperature	73° F.	...	70° F.	77° F.	77° F.	65.5° F.	78° F.
Water temperature							
Surface	74° F.	72° F.	70° F.	76° F.	75° F.	70° F.	74° F.
Bottom	...	...	60° F.	...	64° F.	...	...
Depth at bottom in feet	...	...	30	...	21	...	...
Thermocline location	...	...	None	...	12-18 ft.	...	...
Temperature: top	...	...	...	...	73° F.	...	...
Temperature: bottom	...	...	...	...	64° F.	...	...
Oxygen in p.p.m.							
Surface	4.1	9.7	8.8	4.9	11.6	6.2	8.6
Bottom	...	...	10.2	...	12.0	...	...
Methyl orange alkalinity in p.p.m.							
Surface	144	114	112	137	112	91	...
Bottom	...	...	112	...	...	...	...
pH							
Surface	7.4	8.1	8.2	7.4	8.4	7.2	...
Bottom	...	...	8.0	...	...	...	...

The water of Lake Macatawa is moderately hard (Methyl Orange alkalinity 91-144 p.p.m.) and distinctly alkaline (pH 7.2-8.4). Ordinarily moderately hard, alkaline waters are the more productive. This lake is almost ideal with respect to these factors.

Temperature and chemical conditions in Lake Macatawa, then are certainly favorable to high productivity of warm water fish. No cold water zone exists throughout the summer which could be used by trout or other cold water species.

Some pollution is reported from industrial establishments along the south shore, however, there is no evidence of serious fish losses which can be attributed to such pollution. It may be however that these industrial wastes destroy valuable fish foods and render limited portions of the lake unsuitable for fish. This cannot be determined without more careful studies. The main sources of pollution were as follows: Armours Tannery, Dye Works, Sugar Beet Factory, Hart Cooley factory.

Biological Characteristics

Vegetation

A complete analysis was made of aquatic vegetation in the lake. A list of species and their abundance is given in the following table.

Aquatic Plants from Lake Macatawa and Their Relative Abundance

Common Name	Scientific Name*	Abundance
Waterweed	Anacharis canadensis	Common
Coontail	Ceratophyllum demersum	Abundant
Spike rush	Eleocharis Smallii	Rare
Horsetail	Equisetum fluviatile	Rare
Iris	Iris versicolor	Rare
Soft rush	Juncus effusus	Rare
Rush	Juncus balticus var. littoralis	Rare
White water lily	Nymphaea odorata	Few
Water milfoil	Myriophyllum sp.	Few
Yellow water lily	Nuphar variegatum	Few
Arrow Arum	Peltandra virginica	Rare
Pickerel weed	Pontederia cordata	Common
Pondweed	Potamogeton americanus	Rare
Pondweed	Potamogeton crispus	Common
Clasping-leaf pondweed	Potamogeton Richardsonii	Few
Floating-leaf pondweed	Potamogeton natans	Rare
Sago pondweed	Potamogeton pectinatus	Common
Flat-stemmed pondweed	Potamogeton zosteriformis	Rare
Bur reed	Sparganium eurycarpum	Rare
Wapato	Sagittaria latifolia	Rare
Three-square	Scirpus americanus	Common
Softstem bulrush	Scirpus validus	Few
Common cattail	Typha latifolia	Common
Narrow-leaved cattail	Typha angustifolia	Few
Wild celery	Vallisneria americana	Rare
Musk grass	Chara	Rare

*Determinations by Betty R. Clarke

Twenty-six species of plants were found. The most abundant form was coontail and according to reports this plant is on the increase. This is to be expected since coontail is mainly of the floating type in its habit of growth and as a result is little affected by turbidity. Pondweeds, cattails and bulrush were fairly common.

In general, however, the vegetation beds in Lake Macatawa are poor. If reports are indicative of conditions, the plant beds have shown a marked decline during the past few years. No plants were found in water over 4 feet in depth. This condition seems to be associated with the increase in turbidity resulting from dredging operations in the lake. There is little doubt but that this could be the cause of plant depletion. Any decrease in the turbidity in this lake would most surely result in an increase in desirable aquatic plants. The excellent fishing reported for this lake before 5 years ago could not have existed without good and abundant plant beds.

Fish Foods

The microscopical food organisms (plankton) in Lake Macatawa were very sparse. Bottom samples in the deeper parts contained reasonable numbers of midge larvae and annelid worms. These latter were more numerous in polluted areas. Snails, clams and midges were common on the shoal bottom. Food samples from the plant beds contained many fresh-water shrimp, isopods, snails, mayflies, midges, etc. In general the food conditions in the vegetation zones were considered good.

Forage fish were present in large numbers.

Fish Present

Lake Macatawa supports an unusually large variety of fish. A considerable number of Lake Michigan species find their way into the lake thus increasing the number. A list of the species 50 in all, found or reliably reported for this lake is given in the table below.

Fish Collected or Reported from Lake Macatawa

	SPECIES	Abundance*
Game Fish		
	Yellow perch	A
	Bluegill	A
	Black crappie	C
	Largemouth bass	C
	White crappie	F
	Pumpkinseed	F
	Walleyed pike	F
	White bass	F
	Northern pike	R
	Rock bass	R
	Smallmouth bass	R
	Muskellunge	(reported)
	Rainbow trout	(reported)

*A - abundant, C - common, F - few, R - rare.

SPECIES	Abundance*
Coarse Fish	
Common sucker	A
Sheepshead	A
Channel catfish	C
Yellow bullhead	C
Brown bullhead	C
Shovelhead catfish	R
Redhorse	(reported)
Obnoxious Fish	
Carp	A
Longnose gar and shortnose gar	A
Dogfish	A
Buffalofish	(reported)
Quillback	(reported)
Goldfish	(reported)
Lamprey	(reported)
Forage Fish	
Golden shiner	A
Spottail shiner	A
Bluntnose minnow	A
Lake emerald shiner	A
Sand-colored shiner	C
Common shiner	C
Creek chub	C
Central bigmouth shiner	C
Menona killifish	C
Johnny darter	C
Silversides	F
Iowa darter	F
Blacknose dace	F
Spot-finned shiner	F
Black-nosed shiner	R
Mudminnow	R
Hornyhead chub	R
Central stoneroller	R
Pirate perch	R
Other Fishes	
Great Lakes bloater	R
Cisco	R
American smelt	(reported)
Rock sturgeon	(reported)

*A - abundant, C - common, F - few, R - rare.

Thirteen species of game fish are present in the lake. Yellow perch and bluegills are the most abundant with largemouth bass and crappies being very common. No muskellunge or rainbow trout were seen by the survey party.

The coarse fish included 7 species, with the common sucker and sheepshead being by far the most abundant.

Those species often referred to as obnoxious also include 8 species. Carp, long-nose gar and dogfish are by far the most numerous of this group.

There were 19 species of forage fishes. Four species of these stand out as being exceptionally abundant. They are: golden shiner, spottail shiner, bluntnose minnow and lake emerald shiner.

The Great Lakes bloater and ciscoes are rarely taken in this lake. Sturgeon have been reported several times and smelt were reliably reported for the first time in 1942.

Stocking

Lake Macatawa has received large plantings of bass and bluegills during the past 10 years. This has been possible because of cooperation of the local sportsmen club, who have operated a rearing station. A summary of the total plants made between 1932 and 1942 is given in the following table.

Stocking Report

Lake Macatawa

	1933	1934	1935	1936	1937	1938	1939	1940	1941	Totals
Smallmouth black bass	...	...	...	5,000 (4)*	...	3,000 (4)	6,030 (4)	2,500 (4)	1,700 (4)	18,230
Largemouth black bass	6,000 (4)	5,000 (5)	...	5,000 (4)	8,500 (4)	11,000 (3)	...	4,500 (4)	4,000 (3)	44,000
Wall-eye	700,000 fry	...	100,000 fry	...	...	...	...	...	...	800,000
Bluegills	25,000 (4)	83,000 (4)	60,000 (4)	48,000 (4)	35,000 (4)	96,000 (3)	...	25,000 (4)	24,000 (3)	396,000

*(4) etc., Age in months.

Creel Census

Although we have only meager creel census data it is considered to have sufficient value for presentation. All creel census records were made by Conservation officers at irregular intervals throughout the fishing season. As can be seen, the value of such records depends upon their being representative. We have no way of determining how representative these samples are but present them for what they are worth. A summary of the census taken during 1932, 1934, 1935, 1938 and 1939 is presented below.

Creel Census

Catch per hour	1932	1934	1935	1938	1939	Average
All fish	2.73	2.62	3.50	0.81	2.50	2.43
Smallmouth black bass	...	...	0.03	0.01	...	.02
Largemouth black bass	0.08	0.19	0.01	0.28	...	.14
Bluegill	1.5	1.28	0.45	0.18	0.82	.84
Common sunfish	0.17	0.15	0.03	0.08	...	.11
Rock bass	0.04	0.006	...	...	...	.02
Crappie	0.09	...	...	...	1.60	.84
Perch	0.27	0.91	2.84	0.24	0.09	.87
Wall-eye	0.01	0.02	...	...	...	.02
Bullhead	0.04	0.01	...	...	...	.02
Channel cat	0.06	0.01	...	...	...	.04
N. pike	...	0.01	...	...	...	.01
Percentage of successful fishermen	88%	94%	100%	70%	90%	88%
Hours fished	67.5 hrs.	275.5 hrs.	53 hrs.	70 hrs.	47 hrs.	102.6
Percentage of unsuccessful fishermen	12%	6%	00%	30%	10%	12%
Hours fished	22.5 hrs.	11.5 hrs.	...	26.5 hrs.	4 hrs.	16.12
Number of fish per fishermen	2.1	10.3	15	3.3	5.95	13.27

These data show several interesting points. The average catch per hour of 2.43 fish is much above the state average (about 1.0). The number of successful fishermen is high (88%) and consequently the number of unsuccessful fishermen is low (12%). Perch, bluegills and crappies were the most commonly taken. The catch per hour of largemouth bass was seven times greater than for smallmouth bass although nearly one-half as many smallmouth bass were planted as largemouth bass.

Carp Fishing

Permits have been issued to the Holland Fish and Game Club to take carp from Lake Macatawa. The first carp fishing under these permits was done in 1927 and 1928 and has continued each year to the present. However, records are not available for the years 1929-1934. A summary of the fish captured in the years for which we have records is given in the following table. Only the obnoxious species (dogfish, carp, garpike, sheepshead) were removed.

Carp Fishing in Lake Macatawa

Year	Number of hauls	Carp		Black Bass		Other Game Fish		Obnoxious and Coarse Fish	
		Total number	Average number per haul	Total number	Average number per haul	Total number	Average number per haul	Total number	Average number per haul
1927	21	127,200	6,057	677	32	1,052	50	777	37
1928	15	91,535	6,102	132	9	1,392	93	9,963	664
1935	22	45,202	2,054	9,473	430	59,544	2,661	1,327	60
1936	13	43,073	3,313	970	74	27,635	2,125	2,477	190
1937	16	23,007	1,438	4,160	260	14,506	906	8,276	517
1938	11	14,467	1,315	798	72	9,283	844	12,143	1,104
1939	25	238,191	9,524	4,499	179	8,949	357	23,681	946
1940	16	67,599	4,225	595	37	1,514	94	2,316	144
1941	19	58,839	3,096	2,413	127	185	9	474	25

Comment: Figures for Carp should be "Total Number Pounds"

3/16/43 - Law.

Carp Fishing in Lake Macatawa

Year 1942	No. of hauls	Carp		Black Bass		Other Game Fish		Obnoxious and Coarse Fish	
		Total No. Pounds	Average No. Pounds Per Haul	Total No.	Average No. Per Haul	Total No.	Average No. Per Haul	Total No.	Average No. Per Haul
	13	19,236	1,479	507	39	685	63	329 (Also 1,457 pounds sheepshead)	25

(No figures available for 1943)

Note: Supplement to Institute for Fisheries Research Report No. 833 entitled "A Fisheries Survey of Lake Macatawa, Ottawa County."

-12a-

cc - Holland Fish and Game Club
Claude Lydell
Education-Game
Institute for Fisheries Research
Dr. Brown

3-18-43

These records show considerable variation in the average catch of carp per haul from year to year. The catch of approximately 6000 carp per haul in 1927, and again in 1928 was followed by an average of about 2000 per haul for the years 1935-38 inclusive. In 1939 the catch jumped to 9524 fish per haul—the highest average for which there are records. Oddly enough bass fishing was reported by Mr. DeWaard to have been very good during this year. In 1940 this was reduced to an average of 4225 and in 1941 it went still lower to 3096 fish. It is reported that the catch in 1942 has been poor but we do not yet have records to show this.

A comparison between the number of carp and game fish captured by the nets show that in general where carp catches were high game fish catches were low and where carp catches were low, game fish were high, in fact almost equal in the catch to the number of carp (see chart on page 14). This does not prove that carp is detrimental, or a limiting factor to game fish but may be used as evidence for that contention, assuming of course that fishing grounds and effort were comparable throughout the period. High carp years are noted in 1927, 1928 and 1939. There has been a steady decrease in the average number of carp per seine haul since 1939.

The fluctuation in the number of carp may have been due to natural cycles or to influxes from Lake Michigan or both. The fluctuation in the game fish could likewise be attributed to cycles rather than a direct result of the pressure from the carp population. In spite of the relation which apparently exists between the number of carp and game fish, it would not be safe to assume that the status of one was the direct result of the other in the absence of more reliable data on the anglers catch taken over a period of years.

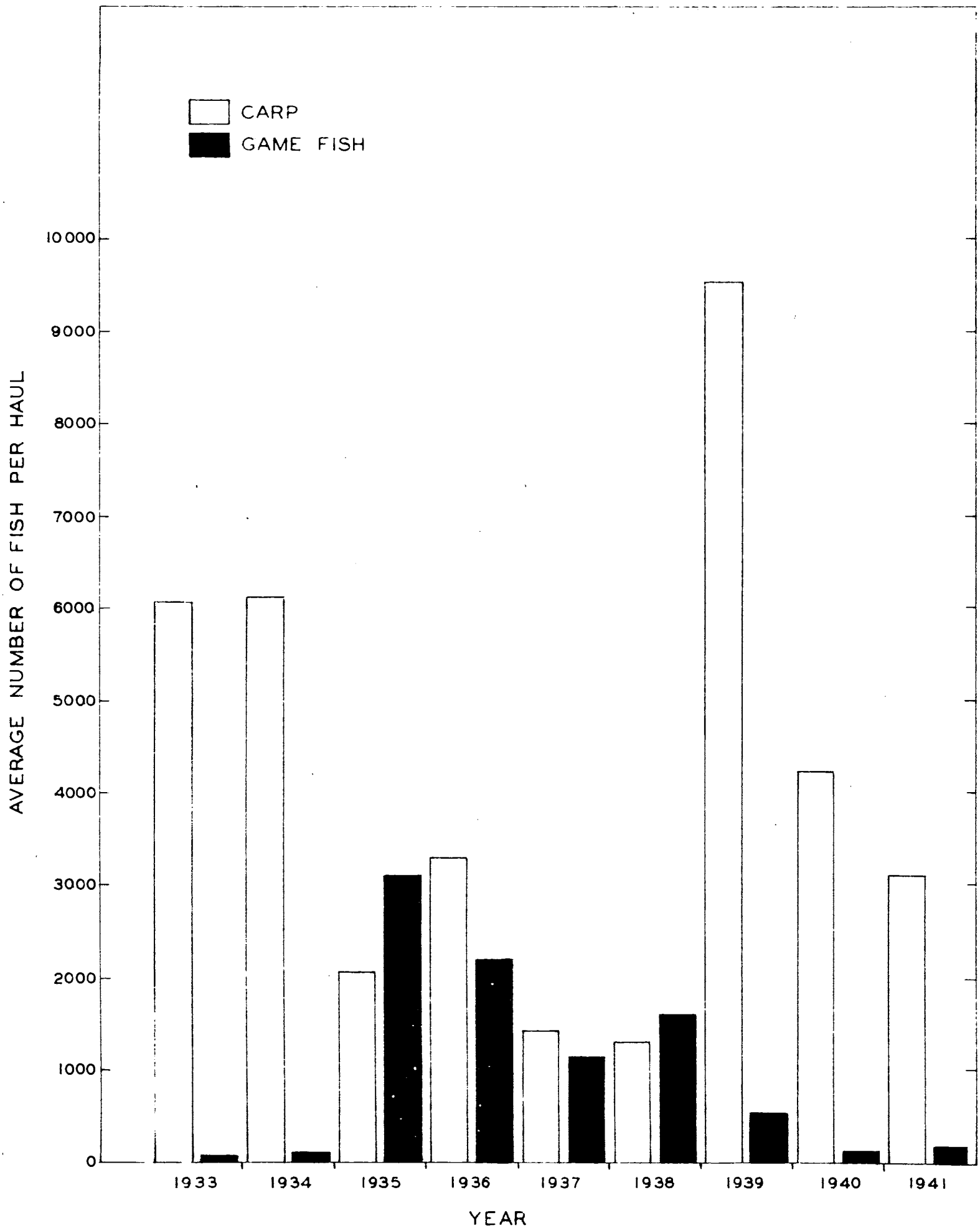
Growth Rate of Game Species

Growth rate studies have been made on the game fish collected by the fisheries survey party. A summary of these data is given in the following table.

Size and Age of Game Fish from Lake Macatawa

Species	Age*	Number of specimens	Average weight Pounds	Ounces	Average total length in inches	State average** Total length in inches
Bluegill	I	12		0.3	2.9	3.0
	II	9		1.3	5.0	4.3
	III	43		3.5	6.6	5.6
	IV	54		5.0	7.4	6.7
	V	10		6.2	7.9	7.4
	VI	6		6.7	8.3	7.8
	VII	1		5.9	7.7	7.9

(continued)


CARP
GAME FISH
AVERAGE NUMBER OF FISH PER HAUL
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1933
1934
1935
1936
1937
1938
1939
1940
1941
YEAR

Size and Age of Game Fish from Lake Macatawa (Continued)

Species	Age*	Number of specimens	Average weight Pounds	Ounces	Average total length in inches	State average** Total length in inches
Yellow perch	I	5		0.4	3.9	4.7
	II	16		1.1	5.4	6.2
	III	61		1.6	6.1	7.1
	IV	33		2.4	6.9	7.8
	V	8		5.1	8.6	9.4
	VI	4		5.9	9.5	10.2
Large-mouth bass	I	11		0.7	4.6	5.5
	II	1		1.3	5.3	8.4
	III	1		...	12.5	10.8
	IV	2	1	4.0	14.1	12.1
	VI	2	1	13.0	14.9	13.3
Black crappie	I	3		0.8	4.4	5.3
	II	16		3.0	6.7	5.9
	III	17		4.9	8.1	8.7
	IV	15		4.8	9.0	9.2
	V	3		7.6	9.5	9.7
	VI	1		9.8	9.8	10.1
White crappie	II	4		3.7	7.5	...
	III	8		5.7	8.9	...
	IV	4		8.4	9.9	...
	V	1		9.5	10.2	...
Northern pike	II	1	2	4.0	20	...
	III	3	5	3.0	27.8	...
	IV	1	6		28.1	...
	V	1	8	12.0	31.0	...
	VII	1	17	12.0	41.0	...
Small-mouth bass	I	1		...	4.0	6.0
White bass	II	1		8.3	10.0	...
	III	1	1	4.0	12.8	...
	VI	1	1	12.0	14.3	...
Cisco	VI	1	1	8.0	15.8	...
Walleye	I	1		2.0	7.3	...
	III	4		12.8	13.4	...
	IV	1		8.6	11.5	...
Rock bass	V	1		6.1	7.5	6.6

(continued)

Size and Age of Game Fish from Lake Macatawa (Continued)

Species	Age*	Number of specimens	Average weight Pounds	Ounces	Average total length in inches	State average** Total length in inches
Pumpkin-seed	I	4		0.2	2.6	2.7
	II	5		1.5	4.8	4.4
	III	4		2.2	5.3	5.8
Sheeps-head	IV	4		11.6	11.4	...
	V	1		10.5	11.3	...

*Age determinations by W. C. Beckman

**Small differences between the total length of the Lake Macatawa fish and state averages are not significant because the date of capture is not comparable.

All of the species for which we have a reasonable amount of data show either average or above average growth with the possible exception of perch which seem to be somewhat below average. Bluegills, pumpkinseeds and perch reach legal length in their fourth growing season while largemouth bass and crappies probably reach legal size late in their third summer.

These growth studies substantiate other observations that, in general, conditions are very favorable to good fish production and growth in Lake Macatawa.

Spawning Facilities

It is believed that spawning facilities in this lake are adequate for bluegills, perch, pumpkinseeds, rock bass, largemouth bass, crappies and northern pike. It is evident that smallmouth bass are poorly suited to this water. The very small number taken by anglers as compared to past heavy plantings is one evidence of this. Also, the general habitat conditions (clear water and rocky bottom) usually found suitable for this species are mostly absent. The presence of limited numbers of smallmouth bass, white bass, cisco and walleyes may be the result of migration from Lake Michigan. The relative scarcity of these fish is probably due to limited suitable habitat and it is not likely that their numbers could be increased by improving spawning conditions or by stocking.

Management Proposals

Designation of Lake

Lake Macatawa is in the classification which permits fishing throughout the year for all species not given seasonal protection and the results of this study gives evidence that this is the proper category.

Stocking

In view of the already large number of game fish present in the lake and the presence of adequate spawning facilities, we recommend the cessation of all stocking until such a time as a need becomes apparent. We believe that the present stocking program has very little to do with maintaining the better than average fishing found in this lake. Recent investigations have shown that natural propagation, where spawning facilities are adequate, will more than maintain the fish population to the carrying capacity of a given water. Stocking for maintenance just cannot be justified under such circumstances.

Predators and Parasites

There is no evidence of damaging predation and the parasites found were of no great concern. A rather large number of gill lice were found on largemouth bass and walleye. Black spot (Neascus) was present on some of the perch and bluegills. No bass tapeworm was positively identified although it probably does occur to some small degree. None of the parasites found is capable of infecting man. No control of predators or parasites is suggested.

Shelter

There is adequate shelter in the aquatic vegetation and although this has been somewhat reduced in the past few years there are still extensive weedy areas.

Regulation of Water Level

The fluctuation of the water level in Lake Macatawa is not of a magnitude sufficient to create unfavorable biological conditions. No regulation is practical or necessary.

Improvement of Spawning Facilities

As has already been mentioned, spawning facilities are adequate for practically all of the game fish now present in the lake with the possible exception of smallmouth bass. This last species may find conditions favorable in the Black River above although we have no evidence of this. At any rate smallmouth bass do not seem to get along well in the lake. We do not believe it is possible to establish this species as an important constituent of the game fish population because of a lack of suitable habitat.

Turbidity

There can be little doubt but that the present reduction of vegetation and possibly the reduction in the number of game fish is the result of increased turbidity due to dredging operations and possibly to some extent to carp activity. The fact that plant beds

are limited to water of less than 4½ feet in depth is clear evidence of this. There doesn't seem to be any ready solution to this matter since dredging at regular intervals is necessary in order to make the lake suitable as a waterway for cargo ships. The removal of dredged material from the lake rather than returning it to deep water would almost surely improve turbidity conditions. This has been in practice since 1936 according to army engineers who claim that dredgings were disposed of in Lake Michigan. If the time between extensive dredging operations is long enough the lake will undoubtedly recover to a certain extent.

Carp Fishery

We do not know what affect the carp fishery has had upon the game fish in this lake. Some contend it has improved the game fishery and others claim that the damage done to game fish more than balances the good resulting from carp removal.

It appears to us that this situation offers a good opportunity to study the relationship between carp and other fish. The facilities of the present carp fishery could be used in this investigation and be carried out under the supervision of the biologist making the study. The local sportsmen could render invaluable assistance toward solving this problem by giving support and material aid. Observations of turbidity and vegetation in relation to the abundance of carp could be made a part of this investigation.

INSTITUTE FOR FISHERIES RESEARCH

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