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A FISHERIES SURVEY REPORT OF MARBLE LAKE, BRANCH COUNTY, MICHIGAN

by

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Introduction

Location and Drainage

Marble Lake, in Branch County, Michigan (T.6,7S., R.5W., Secs. 21, 28, 29, 32, 33, 4, 5) is one of the seven lakes which make up the string of lakes and canals known as the Coldwater-Marble Lake Chain. The outlets of Coldwater and Marble lakes are the source of the Coldwater River which is a part of the St. Joseph River drainage system. This system empties into Lake Michigan in the southwestern part of the state. The chain begins one-half mile southwest of Quincy, Michigan, and extends in a southwesterly direction from that point over a distance of approximately 10 miles.

Marble Lake is the most northerly extension of this chain and is divided into four sections by local inhabitants. These sections, considered from north to south, are locally named First Lake, Second Lake, Third Lake, and Fourth Lake.

Any of these sections are readily accessible from good county roads extending south from U. S. 112 in the vicinity of the town of Quincy.

Acknowledgments

Marginal survey and soundings were made in January, 1941, by the Institute For Fisheries Research; and a party[1] from the Institute completed a biological survey in the summer of 1948.

Past and Present Use

On the northeast shore of that part of the lake designated as Second Lake will be found the plant of the Wolverine Cement Company which from the year 1899 down to 1945 processed marl from several of the lakes of the Coldwater chain into cement by the "wet" process. Marl was transported to this plant by means of tugs and barges traveling over the lakes and canals as far as the north end of the canal leading to Coldwater Lake. These canals were dredged to provide this waterway. Parts of Marble, Archer, Bartholemew and Long Lakes were dredged to obtain the marl. This plant is no longer in operation due to competition with a more economical method of cement manufacture known as the "dry" process. Machinery of the plant has now been sold to South American industries, so that further operation and dredging of these lakes is improbable.

Along the east shore of Third Lake in Section 33 will be found probably 125 cottages and one commercial area devoted to a boat livery, store, and cottages for rent; this development is owned by A. E. Curtis. About 1/4 mile north of this area is another development of about 10 cottages on the east shore of the same lake in Section 28. On the south shores of Third

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1/ I. A. Rodeheffer, leader; Jason Day, assistant.

Lake and Fourth Lake in Sections 4 and 5 are located about five and eight cottages respectively.

Along the shore of a northwest bay of Third Lake there are about 25 cottages and buildings in Section 29 and along the west shore of this same lake in this section there are about 15 cottages. No cottages are built on the west shore of Third Lake in Section 29. The west shore of Fourth Lake in Section 5 has five cottages. This gives a total of approximately 193 cottages on Third and Fourth lakes. No residences are found on the shores of First and Second lakes.

On the east shore of Third Lake immediately north of the south border of Section 28 is located a public fishing site operated by the Department of Conservation. Here will be found a box toilet. A canal has been dredged for the convenience of fishermen in launching their boats. The canal extends from the edge of the lake water easterly into the site for a distance of approximately 100 feet. The fact that the canal does not extend into the lake itself makes it impractical for the use of fishermen in low-water time as, for example, the water at the junction of the lake and the canal was only three inches deep on August 15, 1948. The canal is about three feet deep and dredging at this depth should have been continued into the lake itself for at least another 100 feet to accommodate boats during low-water level.

At the present time the owner of the commercial area immediately south of the public fishing site allows the public to launch boats from his property if they wish. Other places where the public launches boats over private property are located on the northeast shore of First Lake, on the shores of

a bay near the middle of the east canal from First to Second lakes and on the east shore of this canal at its junction with the north canal leading to the Wolverine Cement plant.

Individually owned boats will be found tied up at various places where cottages are not present, such as two on the northwest shore of Second Lake and several spotted along the shore of Third Lake in Section 32, an area only partly wooded and devoted to cultivation and pasture.

Marble Lake is considered a good fishing spot and has been so during past years. It furnishes fishing recreation for local residents and many non-residents from points in Ohio and Indiana and other states. Recently local sportsmen have felt that the catch of fish such as bluegills, large-mouth bass, crappies, and pike has fallen off. This dissatisfaction with returns of fish led to the present survey of Marble Lake and others in the chain.

Because of the public fishing site established on the lake and also because of roads crossing the canals of the lake chain, Marble Lake will always be open to public fishing.

Physical Characteristics

Geological Origin

Dr. I. D. Scott in "Inland Lakes of Michigan" describes the origin of Long Lake and the others of this chain as pits in the glacial outwash plain.2/

2/ A Fishing Report of Long Lake, Branch County, L. Edward Perry, 1941.

Shape of Basin and Extent of Drainage

Marble Lake is considered a "long" lake in that its entire length is approximately 10 times its average width. Its immediate shoreline is low and flat in most places although in some areas it slopes gradually to hills up to about 25 feet in height. Except for the west shore of Third Lake in the area of Section 32 which is only partly wooded, the remainder of the shoreline of that section of the lake is considered wooded. The west and north shores of First Lake are brushy only in the immediate vicinity of the lake, the east and south shores being wooded.

Second Lake is wooded along its entire length except for a small area along the northwest shore devoted to cultivation a short distance back from the brushy shoreline.

Fourth Lake is wooded or partly wooded along its entire shoreline.

Marble Lake encloses several islands most of which were caused by dredgings by the cement company to get from one part of the lake to another and to shorten the haul of the tugs and barges which conveyed marl to the plant. Two large islands are found at the north end of Third Lake, one approximately 1300 feet long and averaging 700 feet in width, the other about 1600 feet long and approximately 200 feet in average width. The most westerly of these two islands is occupied at its south end by one cottage. In the southwest bay of Third Lake is a partly wooded island of about 100 feet by 100 feet known locally as French Island. In this area will be found one of the few shallow shoals of Marble Lake, the drop-off of which is noted for its bass fishing.

At the south end of Third Lake two islands are found, one about 800 feet long with an average width of approximately 200 feet, the other circular in shape with an approximate diameter of 100 feet. Fishing for pike, bass, and bluegills takes place about these islands.

In the southwest section of Fourth Lake is found a brushy circular island about 75 feet in diameter around which fishing for bass and bluegills is popular.

A considerable number of submerged islands are found in the lake which are important in the fishing of this body of water. These islands were left when the quality of the marl was unsatisfactory for dredging by the cement company, and around most of them the drop-off is sharp and extends down to the full depth of dredging. The islands are found supporting emergent, submergent and sometimes floating vegetation. Some of these submerged islands are not shown on the map of the lake, but were drawn in by the biological survey party.

The drop-off along the shores of Marble Lake is sharp as a result of the dredging and few areas are found less than two feet deep. In fact, if the water level of the lake were to be lowered two feet, the drop-off and the edge of the resulting lake would be contiguous in most places so that spawning areas for fish would be practically eliminated.

At a short distance from the water's edge back of the wooded shoreline will be found rolling farm lands and most of the area drained by the lake is of that type. This drainage area comprises approximately 15,520 acres.

Water Fluctuation

At the time of the survey in the summer of 1948 little fluctuation of the water level of Marble Lake was noted. The water fell approximately four inches during the summer months, probably due mostly to drainage through the outlet of the lake, which lies in the northwest bay.

Five inlets into Marble Lake are shown on the county highway maps, all of which are less than a mile in length except Fisher Creek which flows into the southeast bay of Third Lake. This creek drains an area of approximately 7,680 acres. Throughout Sections 4, 9, 16 and most of 15 it has been dredged over much of its length. In the summer of the biological survey the average width of its waters was about 12 feet and the depth averaged approximately one foot. In addition to draining this large area, it is an outlet for Camp Lake in Section 23 of Algansee Township. The stream apparently originates in Section 1 of California Township.

A dam is found across the outlet of Marble Lake. This obstruction is about 40 feet long and 16 inches in height. It has a fishway. Its head of 16 inches of water controls the flow from the lake to this depth. During high water the flow would be considerably more. Evidence of bank erosion shows that at times the water must flow over the dam to a depth of two feet. There is no method of controlling a flow of over 16 inches in depth.

Physical Data

Table I

Physical data for Marble Lake, July, August, 1948

Area in Acres	Maximum Depth	Shore Development	Bottom		Color	Transparency
			Shallows	Depths		
780	60 ft.	4.0	40%	60%	Light Brown	10 ft.

As can be seen from Table I, Marble Lake encompasses an area of 780 acres. It has a maximum depth of 60 feet located in the south end of Third Lake. The shore development of 4.0 shows that the lake has a large number of bays and other projections and indentations of the shoreline, the relationship of the actual shoreline to the circumference of a circle of equal area being four times the length of that circumference.

Approximately 40% of the lake's area lies above a depth of 15 feet while the remainder of the area is found between depths of 15 to 60 feet.

The color of the water is light brown but clear to the extent that a black and white metal disk (Secchi Disk) eight inches in diameter may be seen at a depth of 10 feet.

There is little evidence of wave or ice action upon the shores of the lake. The marl banks where found erode very slowly and much of the shoreline is protected by the brush and other vegetation growing on the banks.

Discussion of Physical Factors in Relation to Fisheries

Because Marble Lake has been dredged, it presents problems peculiar to that type of lake. The dredgings took place without any attempt to create shallows necessary in these waters for the support of fish life.

Dredging took place vertically in most places so that no sloping drop-off was created. Where the edge of the drop-off has slid into the lake a slope has been formed and it is upon these slopes to a depth of about eight feet that vegetation is found. This drop-off area of vegetation is about five feet in average width and extends along most of the shoreline. In this narrow band of weeds will be found most of the young fish in the lake. The submerged islands grow emergent, submergent and in some places floating vegetation along with that found along their drop-offs. These help to increase the productive area of the lake.

In some places the dredgings did not exceed 10 feet in depth and these spaces also add to the areas which grow vegetation.

In general, the dredgings have concentrated the fish along the drop-offs and the few shallow areas. On these small shallow areas large numbers of boats of fishermen collect. Trolling takes place along the sharp drop-offs.

But for the fact that the shoreline of the lake is irregular, the productive area of this lake would be very limited. This irregularity with its drop-offs to some extent compensates for the lack of shallows and makes the lake much more productive of catches of fish than otherwise would be expected.

While the area of the lake is 780 acres, only about 40% or 300 acres is considered to be less than 15 feet in depth. Since sunlight necessary to the growth of plants penetrates the water only to a depth of 10 feet, this fact again cuts down the productive area to only about 200 acres.

This means that about one-fourth of the lake is producing vegetation which is considered to be necessary, or at least helpful, for good production of fish life.

With its present limited shallows and consequent small area of vegetation, Marble Lake is destined to remain, as now found, a large body of water with a small area producing fish large enough for the sportsman's recreation.

Temperature and Chemical Characteristics

Marble Lake is composed of four more or less distinct areas which are known locally as First, Second, Third and Fourth lakes. First Lake which lies farthest north is connected to Second by a natural shallow depression and by an artificial canal. It is a shallow lake 14 feet deep and receives the sewage from the town of Quincy, Michigan. There are definite depressions in Second, Third and Fourth lakes. Chemical analyses were made and temperatures were taken of the water in each of these four parts of Marble Lake. A fifth analysis was made of the water at the extreme south end of Third Lake, as this water is almost separated from the remainder of the lake by several islands. The results of chemical analysis and temperature readings are presented in Table II.

Temperature

Water temperatures are important in fisheries investigations. Each species has a definite range of temperature tolerance as well as a more restricted range of temperature in which it grows best.

Table IIa

Temperature and Chemical Characteristics of Marble Lake, July and August, 1948
(Oxygen readings in parts per million)

Depth, Feet	First Lake		Second Lake		Third Lake (Middle)		Third Lake (South End)		Fourth Lake	
	Temperature (°F.)	O_2 ppm.	Temperature (°F.)	O_2 ppm.	Temperature (°F.)	O_2 ppm.	Temperature (°F.)	O_2 ppm.	Temperature (°F)	O_2 ppm.
Surface	79	9.1	79	8.0	73	8.4	74	8.6	74	8.7
5	...	9.1	...	...	72	...	74	...	74	...
10	72	3.9	75	...	72	...	73	...	72	...
12	...	...	72	7.5	...	...	...	...	...	...
13	64	0.0	...	...	...	...	...	...	...	...
15	...	...	65	3.6	72	7.5	72	8.1	71	7.1
17	...	...	...	...	...	...	...	...	65	6.0
20	...	...	58	2.2	70	7.5	70	7.1	59	2.5
23	...	...	...	...	65	2.9	65	2.2	...	...
25	...	...	55	...	61	1.2	61	1.0	54	0.4
30	...	...	54	...	59	1.0	58	0.9	52	0.0
35	...	...	52	0.0	58	...	54	...	54	...
40	...	...	...	...	56	...	54	2.5	54	2.5
45	...	...	...	...	54	0.4	52	...	52	...
50	...	...	...	...	52	0.5	51	...	...	...
55	...	...	...	...	...	...	50	0.5	...	...

Table IIb

Chemical Data for Marble Lake, July and August, 1948
(Methyl Orange Alkalinity, Phenolphthalein Alkalinity, and Carbon Dioxide in parts per million)

Factor	Depth	First Lake	Second Lake	Third Lake (Middle)	Third Lake (South End)	Fourth Lake
M. O. ppm.	Surface	148	154	158	167	158
	Bottom	231	189	177	173	178
Ph-th ppm.	Surface	13.0	7.0	8.0	8.0	9.0
	Bottom	0.0	0.0	0.0	0.0	0.0
CO_2 ppm.	Surface	0.0	0.0	0.0	0.0	0.0
	Bottom	33.0	14.0	11.0	0.0	32.0

The surface waters of Marble Lake are warm in summer, varying from 73° F. to 79° F. In First, Second, and the south end of Third lakes the water cools rapidly with increase in depth, so that a temperature of 70° F. is found at the 12- to 15-foot levels. In Third Lake the 70° F. temperature comes at about the 20-foot level. Thermal stratification takes place from the 12- to 15-foot depths to the 25-foot depths in First and Second lakes and in Fourth Lake. In Third lake the rapid drop in temperature starts at about the 20-foot level and extends downward to the 25-foot depth. This middle layer of rapidly dropping temperature is known as the thermocline. The water in the upper layer is warm, and circulates due to winds and other causes. The water in the thermocline separates the warm surface water from the deep cold water lying below it. There is decreasing circulation of this water in the middle belt or thermocline region. The water below this belt does not circulate during the summer months. It is cold and the temperatures usually lie in the low fifties or high forty degrees.

Chemical Conditions

Oxygen

The chemical characteristics of water that are of interest in fisheries investigations are the amount of dissolved oxygen and the amount of dissolved minerals (hardness). Dissolved oxygen is necessary to fish and most other forms of aquatic life, which obtain their supply from the oxygen dissolved in the water. The requirements of fish vary somewhat, but 4 to 5 parts per million are considered necessary for the survival of most species at summer temperatures. A good supply of dissolved solids is thought essential for

maximum production of aquatic plants. Moderately hard waters are generally most productive.

In Marble Lake the water above the thermocline (70° F. or above) carried an abundance of dissolved oxygen. In the thermocline the oxygen decreased rapidly toward the bottom of this belt. There is only a layer of two to three feet in depth that is 70° F. or below that carries 4 parts per million or more of oxygen. The water below this becomes increasingly stagnant and has little or no dissolved oxygen during August.

Hardness and Carbon Dioxide

The water of Marble Lake is hard, methyl orange alkalinity being 148 to 231 parts per million. This is about average for marl lakes.

Carbon dioxide varies from zero at the surface to 33 parts per million at the bottom.

Temperature and Chemical Factors in Relation to Fisheries

Temperatures in Marble Lake indicate that the water above the thermocline varying from 15 to 20 feet in depth is warm (generally above 70° F.) and is suitable for warm-water fish. This water carries a high dissolved oxygen content and makes it ideal for these species. Dissolved oxygen in sufficient quantities to support fish life going down to more than 20 feet particularly in Third Lake explains why good catches of bluegills are made during August in this part of the lake at the 18- to 20-foot depths. In the thermocline where water temperature drops to 70° F. and below, there is a very narrow belt of two to three feet that carries sufficient oxygen (4 parts

per million or more) to support cold-water fish. This limited volume of water that will support trout makes the planting of this species questionable. Later in the fall as the surface water cools and reaches the same temperature and density as the cooler lower waters, the lower waters will circulate and be replenished with oxygen. In the late summer the entire volume of cold water below the thermocline will not support fish life because it loses almost all of its oxygen due to decomposing material and respiration of organisms.

Pollution

In the north end of Marble Lake, locally known as First Lake, the sewage disposal plant of Quincy, Michigan, empties its refuse. During July and August of 1948, the water in this lake was always very roily (Secchi Disk reading, 3 feet). A trap net set here for 96 hours caught no fish. Only one fisherman was observed fishing on this lake during the summer. Branch County sportsmen report that until a year ago this lake furnished very good bluegill fishing particularly in the winter. They also report that last winter fishing was no good in this section. They cannot explain the roilyness of the water; they state that it happened sometimes before but never lasted throughout the summer. Time did not permit a thorough check into the causes of this condition or if this water is really toxic to fish. It is, however, a possibility that the sewage disposal into this lake has something to do with it. Mr. C. D. McKenzie, Quincy, Michigan, is of the opinion that the sewage disposal plant which functioned properly when first installed may not be working satisfactorily at present. It is

the opinion of the authors that local authorities or the Branch County Conservation Club will look into this if they are encouraged to do so, as they show a great deal of interest in the fishing conditions of this lake.

The waters in Second, Third and Fourth lakes show no signs of pollution.

Biological Characteristics

The biological characteristics of a lake of interest from a fisheries standpoint are the kinds and abundance of aquatic vegetation, fish food organisms, and fishes. Vegetation is important because it furnishes shelter particularly for young fish, it is used for spawning for such species as perch, it supports organisms used by fish for food, and its photosynthetic activity adds oxygen to the water. Fish foods include microscopic or near-microscopic plant and animal life known as phytoplankton and zooplankton, insects, and other invertebrates. Plankton is usually free-floating and furnishes food for very young fish and the larger fish food organisms. The more important larger fish food organisms are aquatic nymphs and larvae of insects, fresh-water shrimp, snails, clams, leeches, worms, crayfish, and minnows.

A study of the kinds and abundance of fish present is important as well as a large collection of scale samples from the game fish to establish an index of their growth and success.

Vegetation

Marble Lake has a shore development of 4, which means that it has 4 times as much shoreline as a round lake of equal area. This greatly increases

the shallow area available to aquatic vegetation. In general, a cross section of the vegetation zone would show waterwillow, cattail and bulrushes at the margin; muskgrass, bulrushes and in places yellow water lilies on the shallow gradual-sloping shoal; and pondweeds, water milfoil and coontail growing as a narrow belt on the steep drop-off at the deeper edge.

It is this narrow belt of deeper vegetation that harbors most of the young fish in the lake. The north end, comprised of First Lake, Second Lake, and the north end of Third Lake, harbors the greater part of the aquatic vegetation. In the south end, much of the water is so deep that aquatic plants are limited to the narrow drop-off and the shoal. There are numerous small submerged islands in the lake that add to the area of pondweeds present.

Table III presents a list of the aquatic plants found in Marble Lake. Their relative abundance is also given.

Table III

List of Aquatic Plants and Their Relative Abundance in Marble Lake

Common name	Scientific name	Relative Abundance
Waterweed	Anacharis canadensis	common
Sedge	Carex sp.	abundant
Muskgrass	Chara sp.	abundant
Coontail	Ceratophyllum demersum	common
Water willow	Decodon verticillatus	abundant
Lesser duckweed	Lemna minor	sparse
Water milfoil	Myriophyllum sp.	common
Bushy pondweed	Najas flexilis	sparse
White water lily	Nymphaea odorata	sparse
Yellow water lily	Nuphar variegatum	common
Arrow arum	Peltandra virginica	sparse
Smartweed	Polygonum sp.	sparse
Pickerel weed	Pontedaria cordata	sparse
Large-leaf pondweed	Potamogeton amplifolius	sparse
Pondweed	Potamogeton augustifolus	sparse
Pondweed	Potamogeton Friesii	sparse
Sago pondweed	Potamogeton pectinatus	common
Crinkly-leafed pondweed	Potamogeton Richardsonii	sparse
Flat-stemmed pondweed	Potamogeton zosteriformis	sparse
Bulrush	Scirpus sp.	common
Bulrush	Scirpus sp.	sparse
Cattail	Typha latifolia	sparse
Bladderwort	Utricularia vulgaris	common

About 200 acres of the lake bottom is covered with aquatic vegetation. Approximately 3/4 of this area will be found in waters less than five feet in depth. Weed beds extending to a depth of 10 feet in the north end and over submerged islands cover an estimated 40 acres.

Fish Foods

No tests were made for the abundance of plankton in Marble Lake. Plankton is important as a food for very young fish and for many of the larger invertebrate organisms that are of value as food for fish. As the amount of plankton in a lake varies greatly from time to time and from season to season, it is not possible to get a fair index of the plankton in a lake by just a few samplings.

Of the larger fish food organisms in the bottom, mayfly larvae were the most common in all samples taken.

Ekman dredge samples taken from 1 to 33 feet at approximately 5-foot depth intervals found mayfly larvae as deep as 26 feet. The abundance of these insects was further substantiated by an almost nightly hatch in the shallower water up to August 15. Bluegill, rock bass, crappie and occasionally a largemouth bass could be caught on flys just at dusk. Almost every night these insects hatched in such abundance that 12 to 15 fish could be seen feeding around a boat simultaneously. Bloodworms were the other common form found in dredgings. These were usually taken in larger numbers than mayflies but were not taken as frequently. Fresh-water shrimp were taken in some bottom samples but were very much more abundant on the aquatic vegetation. In deep-water sampling (more than 30 feet deep) bloodworms and midge larvae were the forms taken with the Ekman dredge.

Forage minnows were not abundant. A few golden shiners, bluntnose minnows and numerous other species were taken in small numbers in the rather extensive seining that was done here. The skipjack is undoubtedly the most abundant "minnow". This is based on observations, seining, and reports from local residents. Fishermen report that in the fall large numbers of skipjacks may be seen around the docks and in the shallows.

Fish Present

The relative abundance of each species of fish found or reported in Marble Lake is given in Table IV.

A total of 35 species were taken or reported in the lake. Bluegills probably predominate, if one considers catches by fishermen as well as netting operations. The young of perch and largemouth bass are also abundant. But in both of these species larger fish are difficult to get. This is a common complaint of fishermen.

A total of 15 species of minnows were taken, and of these, two species, the stoneroller minnow and the hornyhead chub are creek forms. They were taken in the lake at the mouth of Carpenter Creek.

The most common "minnow" is the brook silverside or skipjack. This is reported very plentiful around docks and boats in the fall of the year. All other minnows are scarce in Marble Lake.

Brown and yellow bullheads are common. They are in demand by fishermen and it is not unusual to see lanterns in boats on the lake until far into the night where people are fishing for these species.

Table IV

List of Fish, Taken or Reported, Their Relative Abundance and Stocking in Marble Lake

Common name	Scientific name	Relative abundance	Stocking record 1933-1945
Game fish:			
Mud pickerel	Esox vermiculatus	few	...
Northern pike	Esox lucius	common	...
Perch	Perca flavescens	abundant	55,000 (6-7")
*Smallmouth bass	Micropterus dolomieu	rare	2,000 (3")
Largemouth bass	Huro salmoides	abundant	35,500 (3-4")
Warmouth bass	Chaenobryttus coronarius	few	...
Green sunfish	Lepomis cyanellus	few	...
Bluegill	Lepomis macrochirus	abundant	776,000 (4")
Pumpkinseed	Lepomis gibbosus	few	...
Rock bass	Ambloplites rupestris	few	...
Black crappie	Pomoxis nigro-maculatus	common	...
*Cisco	Leucichthys sp.	rare	...
*Sturgeon	Acipenser fulvescens	rare	...
Coarse fish:			
Common sucker	Catostomus commersonnii	few	...
Brown bullhead	Ameiurus nebulosus	few	...
Yellow bullhead	Ameiurus natalis	few	...
Obnoxious fish:			
Shortnose gar	Lepisosteus productus	few	...
Longnose gar	Lepisosteus osseus	few	...
Dogfish	Amia calva	few	...
*Carp	Cyprinus carpio	rare	...
Forage fish:			
Blacknose shiner	Notropis heterolepis	few	...
Blackchin shiner	Notropis heterodon	few	...
Sand shiner	Notropis deliciosus	few	...
Spottail shiner	Notropis hudsonius	few	...
Common shiner	Notropis cornutus	few	...
Pugnose shiner	Notropis anogenus	rare	...
Golden shiner	Notemigonus crysoleucas	few	...
Bluntnose minnow	Hyborhynchus notatus	few	...
Stoneroller minnow	Campostoma anomalum	few	...
Hornyhead chub	Nocomis biguttatus	rare	...
Log perch	Percina caprodes	few	...
Johnny darter	Boleosoma nigrum	few	...
Iowa darter	Poecilichthys exilis	few	...
Brook silverside	Labidesthes sicculus	common	...
**Killifish	Fundulus diaphanus	rare	...

* Reported only
** Seen only

Longnose and shortnose gar and dogfish are present. Some fishermen report gars as being very plentiful. Survey party members saw gars at various times but never in large enough numbers to indicate an over-abundance. A few gars and dogfish were taken in trap and gill nets.

Carp have been reported in Marble Lake. Carp are reported to be present in Coldwater Lake which is at the other end of this chain of lakes connected by canals, and if this is true it is possible that they are present in Marble Lake. Survey party members could find no trace of carp.

Stocking

Marble Lake was stocked yearly from 1933 to 1945 with bluegills. Annual plantings varied from 17,000 to 115,000 per year with a total of 776,000 being planted. Plantings, almost yearly, of largemouth bass were made during these years. A total of 35,500 were planted. Two thousand smallmouth bass were planted in 1937. In 1938 and 1939 a total of 55,000 perch were planted.

A Study of the Fish Population in Marble Lake

Marble Lake was selected in the spring of 1948 by the Branch County Conservation Club to be used as an experimental lake for the continued planting of bluegills with the cooperation of the State Conservation Department. The club requested the continued planting of bluegills, claiming that their bluegill fishing dropped off since planting stopped in 1945. The club agreed to keep a voluntary creel census of the fish

caught in the lake. The Conservation Department agreed to make a survey and to make a special study of the fish present in the lake.

In a study of the fish in this lake, three trap nets, four experimental gill nets, a 10-foot and a 30-foot seine, and a 125-foot bag seine were used by members of the survey party. Trap netting was done in July when there was little movement of fish, which limited the number of fish netted. Since large numbers of scale samples were desired, no attempt was made to make population studies by the trap net catches. A record of the total numbers of game fish taken with trap nets, experimental gill nets, and 125-foot bag seine of 1/4 inch mesh, are given in Table V. In the trap net and gill net catches bluegills were the most common species taken, with crappies running a very poor second.

Very few adult largemouth bass and perch were taken by trap and gill net. With the bag seine, made with 1/4 inch mesh and in which young fish were taken almost entirely, perch were by far the most abundant with bluegills second and largemouth bass third.

Table V

Total Fish Taken by Trap Nets, Experimental Gill Nets, and 125-Foot Bag Seine

Species	Gear: 3 trap nets set 528 hrs. per net	Gear: 4 experimental gill nets set 144 hrs. each	Gear: 125-foot bag seine, 6 hauls*	Totals
Bluegills	364	10	748	1,122
Perch	...	4	1,348	1,352
Rock bass	20	3	4	27
Warmouth bass	22	...	18	40
Pumpkinseed	16	...	7	23
Black crappie	41	1	182	224
Largemouth bass	3	4	646	653
Northern pike	10	4	2	16
Green sunfish	...	...	15	15
Mud pickerel	...	...	9	9
Totals	476	26	2,979	3,481

* Some of the hauls with the 125-foot bag seine represent successful hauls with Branch County sportsmen. Fish were counted by sportsmen and returned to water as quickly as possible. No accuracy was attempted in separating young bluegills from young crappies. In similar work done by survey members, tabulations show that the ratio of young bluegills to crappies was about 4 to 1.

Estimated Populations of Young Game Fish in Marble Lake

From the seining operations with a 125-foot bag seine we may make some approximation of the young fish in a lake. It should be pointed out that in Marble Lake almost all fish taken with the large seine were young fish (under three inches in length). The number of game fish taken per haul varied from 200 to 968 with an average of 496 per haul.

Calculations were based on the average number of fish taken in six seine hauls made during the second week in August. It was estimated that 100 feet of shoreline was covered with the 125-foot bag seine in each haul. Marble Lake has a shoreline of 83,590 feet. This would mean that the net would have to be set 836 times to cover the entire shoreline or we may multiply the number of fish taken in an average haul by 835.9 and get an

approximation of the fish around the shoreline. These figures indicate a young fish population of 414,600 (see Table VI).

Table VI

Calculated Number of Young Game Fish in Marble Lake, Based on Seining Operations with 125-Foot Bag Seine

Species	Number of fish taken with 125' bag seine in 6 hauls	Average number per haul over 100' of shoreline	Calculated numbers around shoreline
Bluegills	748	125	105,000
Perch	1,348	224	188,000
Largemouth bass	646	108	90,000
Warmouth bass	18	3	2,500
Pumpkinseed	7	1	1,000
Black crappie	182	31	26,000
Rock bass	6	1	900
Northern pike	2	1	300
Mud pickerel	9	1	900
Totals	2,966	495	414,600

Because of the sharp drop-off, the soft and uneven nature of the marl bottom, and the local abundance of water weeds, operation of the 125-foot bag seine was hindered somewhat, and was limited to an important extent to the more open shoal areas. This selectivity meant that the seining tended to miss those areas with the greatest concentration of young fish. For example, in the northern end of the lake where aquatic vegetation was the most abundant and where the greatest number of young fish were congregated (based on observations), seining was almost an impossibility. A few seine hauls were attempted in this part of the lake using a smaller seine. It was set in deep water just beyond the vegetation from a boat and pulled to shore with ropes. This seining took far more fish per area than were taken by the large bag seine. This, and similar observations

around the lake, showed that the population figure of 414,600 young fish for the lake was extremely conservative. Undoubtedly the actual population of young game and pan fish in Marble Lake was several times this figure.

In connection with the question of need for artificial stocking, it should be noted that the population of young game and pan fish in the lake during the summer of 1948, all resulting from natural reproduction, was greater than the combined total of the heavy plantings from State hatcheries for the 13 years from 1933 to 1945 (see Table IV).

No estimate is made of any of the larger fish. Fish taken in trap or gill nets were too few to warrant any kind of conclusions about fish populations. Gill netting and trap netting for adult fish in lakes is least effective during summer months, and most effective during spring or fall. The survey netting did not give a satisfactory estimate of the abundance of adult fish.

Size of Game Fish

Table VII presents the number of game fish taken by sizes in Marble Lake. All of the smaller fish (less than three inches) were taken by seining. Larger size fish were taken with experimental gill nets 125 feet long and with 1 1/2- to 4-inch stretched mesh, and miniature commercial trap nets. These gill nets and traps will permit 3- to 4-inch fish to escape and undoubtedly failed to hold most of the 4- to 5-inch fish. Six- to seven-inch bluegills were the dominant size fish taken in the trap and gill nets. This is somewhat at variance with reports of fishermen who maintain that they catch 3 or 4 fish 5 to 6 inches long for every one 6

Table VII

The Number of Different Sizes of Game Fishes Taken by Trap Netting, Gill Netting, Seining, and Hook and Line Fishing in Marble Lake, Branch County, Summer of 1948

		Length in inches								
Species	Net used	Less than 3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	11-12
Bluegill	trap	...	1	12	98	195	41	17	...	...
"	gill	...	...	1	3	6	...	...	...	...
"	seine	770	20	10	...	...	...	...	...	...
Perch	trap	...	...	...	...	...	...	...	...	...
"	gill	...	...	...	...	...	2	...	2	...
"	seine	1,335	1	12	27	10	1	2	...	...
Black crappie	trap	...	...	...	1	3	4	15	18	1
"	gill	...	...	...	...	...	1	...	...	...
"	seine	179	...	...	...	2	1	...	...	...
Pumpkinseed	trap	...	...	1	7	7	1	...	...	...
"	gill	...	...	...	...	...	...	...	...	...
"	seine	12	22	7	3	1	...	...	...	...
Warmouth bass	trap	...	...	1	4	11	6	1	...	...
"	gill	...	...	...	...	...	...	...	...	...
"	seine	5	4	6	9	3	1	1	...	...
Rock bass	trap	...	...	1	2	2	3	8	4	...
"	gill	...	...	...	1	1	1	...	...	...
"	seine	5	3	14	14	2	...	...	...	...

		Length in inches										
		Less than 3	3-4	4-5	7-8	9-10	10-11	11-12	13-14	14-15	15-16	16-17
Largemouth bass	trap	...	...	...	1	2	...	...	...	...	...	...
"	gill	...	...	...	1	1	...	...	...	1	...	1
"	seine	641	4	1	1	...	...	...	...	...	...	...
"	h & l*	...	...	...	...	1	2	2	5	1	1	...

		Length in inches												
		11-12	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	24-25	25-26	30-31
Northern pike	trap	...	...	1	2	...	...	1	...	1	1	1	...	1	1
"	gill	...	1	...	3	1	...	...	...	...	...	...	...	...	...
"	seine	1	2	...	...	...	...	...	...	...	...	...	...	...	...
"	h & l*	...	1	...	...	1	1	2	2	1	1	...	2	...	...

* Hook and line fishing with live minnows.

to 7 inches or larger. When creel census figures become available from the Branch County Sportsmens Club, it will be interesting to see what size is the most common catch.

The sizes of perch, black crappie, pumpkinseed, warmouth bass, rock bass, largemouth bass, and northern pike, given in Table VII, will be of interest to the Branch County club for comparison with their creel census records. Fishermen were keeping creel records at the time of the survey.

Creel Census

A voluntary creel census was started on Marble Lake with the start of the 1948 fishing season. The Branch County Sportsmens Club is taking this tabulation. The original data from this census should be available in the near future. The keeping of a record of their catches has convinced some of these sportsmen that there are sufficient young bluegills in the lake.

Growth Rate of Game Species

A large collection of scale samples from the game fish of Marble Lake was taken by the survey party during the summer of 1948. These samples will be analyzed at the Institute laboratory in Ann Arbor.

Natural Propagation

During the last few days of June a careful count of the bluegill spawning beds in Marble Lake was made. A total of 1,583 nests were counted. In addition there were several areas that were not checked that fishermen

later reported as bluegill spawning areas. Undoubtedly many of the nests had also been destroyed by wave action. There is no doubt that many nests were not found. Some years ago Mr. W. F. Carbine, then of the Institute for Fisheries Research, counted the eggs in bluegill nests and found that an average nest contained 17,000 eggs (personal communication). If Marble Lake bluegills lay the average number of eggs, and there were at least 1,583 nests in 1948, then the bluegill egg crop should have been better than 26,000,000 eggs. If we may estimate that half of these hatched, the young bluegills produced in the lake should have been around 13,000,000 in 1948.

Sixty-two bass beds were counted. Judging from the number of young bass in the lake a great many nests were not found. Only 30 sunfish nests that could definitely be distinguished as such were counted.

It is the opinion of the survey party that spawning facilities for bluegill, bass, sunfish and pike are adequate to furnish sufficient young of these species.

Management Proposals

At present Marble Lake is in the category of "all other lakes". Our investigations show that this should be continued. It is not suitable for trout stocking, and therefore could not be considered as a trout lake.

The 1948 survey data do not offer a basis for recommending any change in regulations on the warm-water fish in Marble Lake. This is of interest, in view of the fact that the advisability of more liberalized fishing

regulations is being considered and tested on an extensive scale on lakes of the southern part of the state. An excessive population of large fish is the evidence which would favor liberalized regulations. Seining on Marble Lake produced large numbers of small fish; but the netting took few fish of the intermediate and larger sizes. The failure to take larger fish in impressive numbers was due to the fact that the warm summer months are a poor time to catch lake fish with gill and trap nets, as compared to spring and fall, and this aspect of the survey record is inconclusive.

Stocking

It is understood that Marble Lake is to be used as an experimental lake, and plantings of bluegills are to be continued. The purpose in making these plantings, by mutual agreement of the Conservation Department and the Branch County club, is to demonstrate to the local anglers the amount of returns which they will get from the planted hatchery fish. The planted fish would need to be marked (by fin-clipping), or else a system of planting in alternate years could be followed by age studies to evaluate the plantings.

It is our opinion that such plantings are not necessary for continued good fishing in the lake.

Predators and Parasites

At least four species of turtles are abundant in Marble Lake. Blue heron, American bittern and kingfishers are frequently seen. Several parties are trapping turtles and it is likely that this may help to control these reptiles.

Gars and dogfish although present are not considered to be of sufficient numbers to warrant control measures.

Parasites are not common in the fish. The one most often found is the black spot parasite in the muscles of bluegills. White spot parasites were present, particularly in the liver of numerous fish. A few yellow grubs were visible in the muscles of largemouth bass. No bass tapeworm were found.

Shelter

Aquatic vegetation provides the available shelter in the lake at the present time. The irregular shoreline and the numerous bays and canals are especially favorable to the growth of plants.

It is questionable if brush shelters would be of value in Marble Lake. In the shallower waters vegetation furnishes sufficient shelter. The deeper areas are so deep that shelters are not recommended.

Regulation of Water Level

A dam in the outlet (source of the Coldwater River) stabilizes the present level. Further control is not thought to be necessary.

Improvement of Spawning Facilities

Installation of bluntnose minnow spawning devices should be beneficial in this lake. The bluntnose is present but not in large numbers. This

may be due to a lack of spawning places. Installation of such devices should increase the numbers of this minnow. This might well be done as a club project, or on an individual basis by cottage owners under club guidance.

INSTITUTE FOR FISHERIES RESEARCH

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