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FISHERIES SURVEY OF PRISON LAKE (TYLER), JACKSON COUNTY, MICHIGAN

by

C. J. D. Brown

Introduction

Location and Drainage

Prison Lake is located in the southeast corner of Section 18, T. 2 S., R. 1 E., Leoni Township, Jackson County. It and one other little lake drain to the west and north through a very small, intermittent tributary of Portage River which in turn is tributary to the Grand River only 2 or 3 miles to the west. The lake is only accessible by a small farm road across the State Prison property or across a private farm on the north side. Good county roads lie within one-half mile of the lake.

Acknowledgments

We are endebted to the Department of Conservation Field Administration personnel of the Regional and District offices in Jackson for facilities and help to the survey party.

The lake was mapped by an Institute party* at the same time the biological inventory was made June 29, 30, 1942.

Past and Present Use

This small lake has been little used except as a source of ice for farms in the vicinity. Its extremely boggy nature makes it of little or no value for cottage development or as a swimming resort. There are no cottages or boat liveries on the lake.

Insofar as we were able to determine, the lake is owned, in part, by the State Prison, i.e., approximately the west one-third, and the rest by a single farmer whose farm borders the lake on the north and east. The portion owned by the prison is posted against trespassing so as far as the actual use of the lake is concerned it is strictly private. In earlier times the lake was fished frequently by farmers of the vicinity and good catches of perch and bluegills were reported. At present the lake seems to have deteriorated as far as fishing is concerned. Fishing is light, engaging only a few of the

*The party personnel included C. J. D. Brown, R. C. Ball and L. E. Perry.

Prison maintenance personnel and the farmer who owns part of the lake. Winter kill has been largely responsible for the lack of good-sized fish in the lake. It has practically no potential value as a public fishing water.

Physical Characteristics

Geological Origin

Although nothing specific is known about the geological origin, it is safe to say that the basin of this lake and the one to the southeast are what is left of a glacial lake of a square mile or more in extent. Vegetation is encroaching rapidly and it will probably be only a matter of a few years until the lake will disappear unless measures are taken to prevent it. From the point of view of fisheries, this lake has definitely passed its optimum productivity.

Shape of the Basin and Extent of Drainage

The present basin of Prison Lake is roughly pear-shaped with the long axis running east and west. The deepest part (19-foot contour) is a narrow strip parallel with the north shore about 120 feet beyond the encroaching shoreline. The immediate shore is a bog mat suspending tufts of marsh grass and creeping patches of water willow. To the west, south, and east there is an extensive swamp of almost a square mile. This constitutes the drainage basin. On the north high hills of sandy soil extend for some distance. The swamp is rather heavily wooded and the rolling highlands with intermittent bog lands are used extensively for agriculture.

Water Fluctuation

Water fluctuation in this lake is probably negligible. There is no marked inlet or outlet but the water supply comes through the swamp on the east and leaves by an open marsh on the west.

Other Physical Features

Prison Lake has an area of 5.8 acres and a maximum depth of 19 feet. Its shoreline development (considering the outer edge of the mat as shore) is 1.35. This means that the shore is only 1.35 times longer than if the lake was perfectly round and of the same area.

The lake bottom is composed almost exclusively of pulpy peat. Fibrous peat, of course, is dominant in the floating mat. One small patch of cinders can be found in the vicinity of the dock at the west end. Bottom sediments are very loose so that it is difficult to tell exactly how deep the water is.

The water is stained a light brown by the extensive organic sediments in and around the lake. A Secchi disc was only visible to a depth of 3 2/3 feet at the time of the survey. This indicates much more color and turbidity than is found in most Southern Michigan lakes.

Physical Factors in Relation to Fisheries

As already pointed out, this lake does not have many favorable characteristics as far as fisheries are concerned. Its small size, soft unstable bottom, high color of the water and lack of good spawning facilities are certainly not conducive to high fish productivity.

Temperature and Chemical Characteristics

Temperature

There was definite thermal stratification in Prison Lake at the time of the survey. A thermocline (zone of rapid change in temperature) extended from 3 to 12 feet. The surface temperature was 76°F. This decreased to 75°F. at 3 feet and to 65°F. at 6 feet. At 12 feet the temperature was 58°F.

Chemical Conditions

Chemical analyses of the water showed the surface water to contain 5.2 p.p.m. of O_2. At 6 feet there was just a trace. This shows that there was barely any water in the thermocline (i.e. below 4 feet) which had sufficient oxygen to support fish life. Water from the 9-foot level had no dissolved oxygen at all. There was 8 p.p.m. of carbon dioxide at the surface and this increased to 28 p.p.m. at 9 feet. This indicates that the water has a high organic content.

Even though this lake is distinctly of the bog type the water is strongly alkaline (pH 7.2-8.4). It is also hard (Methyl Orange alkalinity 168-195 p.p.m.). The factors of alkalinity are favorable to high productivity but the low dissolved oxygen content renders all except the surface four feet of water useless for fish and most fish food organisms during the periods of stagnation.

No pollution of any kind was observed.

Biological Characteristics

Aquatic Vegetation

Aquatic plants were fairly numerous in kinds and abundance. A list of the different species and their relative abundance is given in the table below:

Common name	Scientific name	Abundance and location
Water milfoil	(Myriophyllum exalbescens)	Abundant, from edge of water lilies out to depths of about 10 feet. Around entire lake.
Coontail	(Ceratophyllum demersum)	Abundant, among Myriophyllum.
White water buttercup	(Ranunculus longirostris)	Abundant, among above two species but in shallower regions.
Yellow water lily	(Nuphar variegatum)	Abundant, form a dense ring around entire lake from shore to depths of about 5-10 feet. Width of beds about 15 to 25 feet.
White water lily	(Nymphaea odorata)	Common, scattered among beds of Nuphar.
Pondweed	(Potamogeton zosteriformis)	Common, on outer edge of Myriophyllum.
Floating-leaf pondweed	(Potamogeton natans)	Scattered.
Water willow	(Decodon verticillatus)	Common, around most of shore, shoreward from lily beds.
Star duckweed	(Lemna trisulca)	Common, among Myriophyllum beds.
Big duckweed	(Spirodela polyrhiza)	Few.
Cattail	(Typha latifolia)	Common around most of shore.
Manna grass	(Glyceria septentrionalis)	Common in very shallow water and marsh on west end of lake.
Sedge	(Carex rostrata)	Scattered along shores.
Arrowhead	(Sagittaria latifolia)	Few along shores.
Skullcap	(Scutellaria epilobiifolia)	Few.
Marsh cress	(Rorippa islandica)	Few.
Swamp milkweed	(Asclepias incarnata)	Scattered around shores.

Water milfoil, coontail, white water buttercup, and the yellow water lily were the most abundant species of consequence to fish. The zone bearing plants would average about 50 feet in width around the entire lake. It can certainly be said that vegetation is abundant enough to supply the fisheries needs in this lake such as cover, feeding areas and spawning grounds. The tendency in lakes of this sort is for too many plants rather than too few. As the lake gets older the amount of open plant free water will decrease.

Fish Foods

The small (microscopic and semimicroscopic) free-floating organisms known as plankton are rather numerous in Prison Lake. The microcrustacea such as Daphnia and Cyclops were especially abundant. These are very important because they are the food of young fishes, minnows, and of other larger food organisms. The larger fish-food organisms were not very abundant. Hardly anything exists on the pulpy peat bottom. The plants support many midges, scuds, dragon- and damselfly larvae. The scuds were very small in size and would not make up a very large quantity.

The only forage fish observed were adult golden shiners. Others may be present in small numbers. Careful seining could not be carried out because of the unstable bottom.

On the whole, we would say that food conditions for game fish are, at best, only fair.

Fish

Six species of game fish were observed or reliably reported for Prison Lake. Only one species of coarse fish (brown bullhead) and one of forage fish (golden shiner) were collected. A summary of the kinds of fish and their relative abundance is given in the following table:

Species	Abundance
GAME FISH	
Yellow perch	Few
Largemouth bass	Few
Bluegills	Common
Pumpkinseeds	Abundant
Bluegills x Pumpkinseeds	Common
Warmouth bass	Common
Black crappie	Reported
COARSE FISH	
Brown bullhead	Common
FORAGE FISH	
Golden shiner	Common

There was evidence of considerable hybridation of bluegills and pumpkinseeds. Five hybrid specimens were collected.

So far as can be ascertained, no official state plantings of fish have been made in this lake. Introductions have undoubtedly been made by private individuals in the past since the lake has winter-killed several times according to reports. The last known stocking of fish was made by ~~the~~ Conservation Officer William LeMieux about 2 or 3 years ago when he reportedly transferred a miscellaneous unknown number of small fish from a prison pond to this lake. Mr. LeMieux reports that bluegills, pumpkinseeds, minnows and bullheads were present in the lot of fish he transferred, as well as others which he did not recognize.

Creel Census

No creel census data is available.

Growth Rate of Game Species

The scales of a number of perch, bluegills and pumpkinseeds were saved for age determinations and a growth rate study. A summary of these data is given below:

Species	Number of fish	Age*	Average total length, inches	Average weight, ounces
Yellow perch	2	III**	7.3	2.6
Bluegills	4	I	2.9	0.2
	2	II	3.5	0.5
	2	III	6.3	2.5
Pumpkinseeds	1	I	3.7	0.6
	10	II	4.1	0.7
	7	III	4.6	1.1
	4	IV	4.9	1.3
	1	V	5.2	1.6
	3	VI	5.3	1.9

* Age determinations by W. C. Beckman.

**All fish have actually had a half growing season in addition to the age indicated.

Yellow perch from Prison Lake probably reach legal length in their third summer of life and bluegills in their fourth summer. The growth of these two species is equal to the state averages given by W. C. Beckman. The pumpkinseeds were all less than 6 inches even though some of them were 6 years old. They are far below the state average for this species. This condition probably is the result of overpopulation by this species which is obviously the most abundant one in the lake. We were not able to get any adult largemouth bass and, as a result, could not determine the growth rate of this species.

Management Proposals

Designation of Lake

Prison Lake is in the "all other lakes" classification and this investigation shows this to be the proper category.

Stocking

No stocking of perch, bluegills, pumpkinseeds, crappies or largemouth bass should be necessary unless future winter-kills remove the stock now present.

The planting of a few breeder northern pike would undoubtedly be an asset to the lake. There is adequate spawning ground for this species and it might tend to reduce the pumpkinseed population.

Predators or Parasites

No parasites were observed on the game fish captured. Predators such as turtles and snakes were numerous, but it is believed that they do little, if any, damage to the fish population.

Shelter

There is adequate shelter in the aquatic vegetation found in the lake.

Regulation of Water Level

The water fluctuation is not serious and means of regulating the water level are impractical.

Improvement of Spawning Facilities

Spawning facilities are only fair for bluegills and largemouth bass. The development of a small gravel bed on the west end would undoubtedly help to increase these species. The area of this bed would not have to be greater than 500-1,000 square feet.

Other Suggestions

About the only possible way to greatly improve this small lake for game fish would be to remove a large quantity of the soft pulpy peat bottom. This would deepen the lake and remove the cause for stagnation and winter-kill. While any attempt at removal would be an experiment, it is believed that the bottom materials could be sucked out with the "sand sucker" type of dredge in common use along our inland waterways. It should be pointed out that the deposits removed might well be valuable fertilizer when applied to poor sandy soils of the Prison farm adjacent to the lake.

If an attempt is made to remove these lake deposits, the Institute for Fisheries Research would like to follow the experiment and study the results.

INSTITUTE FOR FISHERIES RESEARCH

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