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A FISHERIES SURVEY OF BIG SILVER LAKE,
WASHTENAW AND LIVINGSTON COUNTIES

by

C. J. D. Brown

Introduction

Location and Drainage

Big Silver Lake is situated on the Michigan base line which serves as the boundary between Washtenaw and Livingston Counties. The great majority of this lake lies within Washtenaw County in Dexter Township (T. 1 S., R. 4 E., Sec. 3, 4), but one or two small bays extend into Livingston County (T. 1 N., R. 4 E., Sec. 33, 34). The lake lies within the Huron River Drainage and is tributary to Portage Creek which connects it to the Portage Lakes.

There are no very large towns near Big Silver Lake. The Village of Pinckney is about 3 miles to the north and the town of Chelsea is 7 miles to the south. Good gravel roads lead to the lake, making most of its shores accessible.

Acknowledgments

A map was prepared of this lake by the same Institute party* which

* The survey party included: D. C. Chandler, leader; E. L. Cheatum, Walter Crowe, assistants. Other Institute personnel assisted and Dr. Carl L. Hubbs helped with the fish collections.

made the regular fish survey.

Acknowledgment is due Mr. Otto Andres who turned over his cottage for the use of the survey party while they were stationed at the lake.

Past and Present Use

So far as is known, Big Silver Lake has never been the site of any industrial establishment or within the bounds of any municipality or village. It has considerable cottage development, however, and has two large camps on the north and east shores. There are no resorts and only one boat livery on the lake.

There is no state-owned frontage but the public has access by tolerance of some property owners from the roads which skirt the south and southeast shores. The lake is used extensively for swimming and boating as well as for fishing. A moderate amount of fishing is reported for both winter and summer, although catches, particularly of largemouth bass, are said to be much smaller than formerly.

Physical Characteristics

Geological Origin

So far as is known, no studies have been made to determine the geological origin of Big Silver Lake and we have no information on this subject.

Shape of Basin and Extent of Drainage

The basin of Big Silver Lake is roughly U-shape, with the open part of the letter pointing to the southwest. The major depression is located slightly north of center in the main portion of the lake. It has a maximum depth of 47 feet. Another small depression in the south arm has a depth of 25 feet. The sides of the basin are fairly steep beyond 400 feet from shore but the contours are rather irregular.

The immediate shore is partly wooded and partly low pasture lands, while the surrounding country is quite hilly and mostly wooded. Some poor quality farms lie within the drainage.

Water Fluctuation

There is considerable water fluctuation in Big Silver Lake. Its water supply is limited to one small tributary from Little Silver Lake on the south, and to seepage entering through the marsh on the northwest border.

A dam has been placed in the outlet (Little Portage Creek) supposedly to maintain a higher constant water level. Reports indicate a disagreement as to a proper level and as a result the tampering of many individuals has destroyed its effectiveness. There have been times when the water was so low that most of the good beach on the east side of the lake was out of water. The dam is not passable to fish.

Physical Characteristics in Relation to Fisheries

Big Silver Lake has a surface area of 217 acres. About half of the lake is over 20 feet in depth. The shoreline is somewhat irregular with a development of 1.8. This means that the shoreline is nearly twice as long as it would be if the lake were perfectly round and of the same area. The bottom in the shallow zone (less than 20 feet in depth) is composed of marl with a fringe of sand on the east side. Pulpy peat is the predominating bottom type in the deeper zone. Small patches of fibrous peat were found in the bays to the west and gravel is scattered quite generously all around the more solid, inundated beach.

The water was without color and was only slightly turbid at the time of the survey. Very little wave or ice action is noticeable as evidenced by the well developed aquatic vegetation beds around most of the lake.

The sandy beach on the east, however, is devoid of plants, no doubt as a result of wave action.

In summary, it might be said that most of the physical factors operating in Big Silver Lake are favorable to high fish production with the possible exception of the fluctuating water level. The presence of extensive shallow bays, rich soils, suitable gravel and sand areas for spawning fish, clear water and the absence of destructive wave action makes it potentially productive.

Temperature and Chemical Characteristics

Temperature

One series of temperatures (from top to bottom) was taken in the deepest depression June 17, 1937. The water down to 12 feet had an almost uniform temperature of 72°F. Between the 12- and 30-foot levels this dropped to 53°F. or a decline of 19°F. This zone of rapid change in temperature is known as the thermocline, and it blankets off the water below, preventing circulation or the replacement of dissolved oxygen. Water on the bottom of Big Silver Lake was 49°F. and would probably remain near that temperature for the duration of the summer.

Oxygen

If the oxygen in the lower area is used up there is no chance for a replacement until the fall turnover. In Big Silver Lake the dissolved oxygen was 3.9 p.p.m. near the surface, 4.0 p.p.m. near the bottom of the thermocline (27 feet), 2.1 p.p.m. at 36 feet, and 0.5 p.p.m. at 43 feet. The water below 27 feet did not have enough oxygen to maintain fish life even by the middle of June. This means that by the end of summer all of the fish inhabiting the lower region (below 25 feet) must move near to the surface or die.

Alkalinity and pH

The water in this lake is hard (Methyl Orange Alkalinity 148-162) and is definitely alkaline (pH 7.3-8.4). These factors are definitely favorable to good fish production because alkaline, moderately hard water lakes usually produce a larger crop of fish food organisms than do soft water lakes. On the other hand, very hard waters are sometimes much less productive than those with moderate amounts of dissolved minerals.

Pollution

No pollution of any kind was reported for Big Silver Lake.

Biological Characteristics

Vegetation

There was a total of 28 species of the higher aquatic plants collected in Big Silver Lake. A complete list of the species appears in the following table.

Aquatic plants collected in Big Silver Lake

Species	Abundance *
Waterweed (<u>Anacharis canadensis</u>)	S
Water shield (<u>Brasenia Schreberi</u>)	S
Cladium (<u>Cladium mariscoides</u>)	C
Three-way sedge (<u>Dulichium arundinaceum</u>)	C
Spike rush (<u>Eleocharis capitata</u>)	S
Spike rush (<u>Eleocharis variegatum</u>)	S
Horsetail (<u>Equisetum limosum</u>)	S
Coontail (<u>Ceratophyllum demersum</u>)	C
Bushy pondweed (<u>Najas flexilis</u>)	A
White water lily (<u>Nymphaea odorata</u>)	S
Yellow water lily (<u>Nuphar advena</u>)	S
Smartweed (<u>Polygonum amphibium</u>)	R
Pickereel weed (<u>Pontederia cordata</u>)	C
Largeleaf pondweed (<u>Potamogeton amplifolius</u>)	A
Pondweed (<u>Potamogeton angustifolius</u>)	C
Pondweed (<u>Potamogeton Friesii</u>)	C
Variable pondweed (<u>Potamogeton gramineus</u>)	C
Floating-leaf pondweed (<u>Potamogeton natans</u>)	S
Whitestem pondweed (<u>Potamogeton praelongus</u>)	C
Mermaid weed (<u>Proserpinaca palustris</u>)	S
Wapato (<u>Sagittaria latifolia</u>)	R
Hardstem bulrush (<u>Scirpus acutus</u>)	C
Three-square bulrush (<u>Scirpus americanus</u>)	C
Bulrush (<u>Scirpus cyperinus</u>)	C
Cattail (<u>Typha latifolia</u>)	S
Bladderwort (<u>Utricularia intermedia</u>)	C
Bladderwort (<u>Utricularia vulgaris</u>)	C
Musk grass (<u>Chara</u>)	A
Musk grass (<u>Nitella</u>)	A

* A=abundant, C=Common, S=sparse, R=rare.

Plant identifications by C. O. Grassl.

Musk grass, bulrush, bushy pondweed, pickereel weed, and bladderwort were apparently the most abundant plants in the lake at the time of the survey. Musk grass was found extensively over most of the marl areas and even up on the sand near shore.

The presence and extent of aquatic plants is one of the best indicators of lake productivity which we know of. Plant beds harbor the most important constituents of the fish food population and, as well, offer protection and shelter for minnows and the young of game fish. Without plants no lake is

very productive. Big Silver Lake has an abundance of aquatic plants. The beds are not of maximum density or extent but are dispersed well around the lake and certainly should serve the requirements of a large fish population.

Fish Foods

Collections showed that fish-food organisms were varied and numerous in Big Silver Lake. Mayflies, midge larvae, snails, freshwater shrimp and aquatic worms were the most common species found. Larger forage was present in the form of frogs, toads and numerous forage fishes. Indications are that fish food conditions in Big Silver Lake are satisfactory and possibly better than the average of other lakes this size found in the same general region.

Fish

A total of 27 different species of fish were collected from Big Silver Lake at the time of the survey. Ten of these were game fish if such species as warmouth bass, rock bass, green sunfish, and long-eared sunfish are included. Three species of coarse fish were present and 14 species of forage fish.

A summary of the species found, along with their relative abundance and stocking, is given in the following table.

Fish collected from Big Silver Lake

Species	Abundance	Stocking 1934-1940	Age (months)
GAME FISH			
Northern pike	Common	...	
Yellow perch	Common	27,500	7-9
Smallmouth bass	Few	600	3
Largemouth bass	Abundant	6,550	3-6
Bluegill	Abundant	87,500	4-6
Pumpkinseeds	Common	...	
Rock bass	Few	...	
Warmouth bass	Few	...	
Green sunfish	Common	...	
Long-eared sunfish	Common	...	
COARSE FISH			
Lake chub-sucker	Common	...	
Brown bullhead	Common	...	
Yellow bullhead	Common	...	
FORAGE FISH			
Red-bellied dace	Rare	...	
Black-nosed shiner	Common	...	
Black-chinned shiner	Common	...	
Mimic shiner	Rare	...	
Straw-colored shiner	Few	...	
Common shiner	Abundant	...	
Blunt-nosed minnow	Common	...	
Tadpole cat	Rare	...	
Mud minnow	Common	...	
Menona killifish	
Black-banded top minnow	Rare	...	
Iowa darter	Common	...	
Least darter	Few	...	
Silversides	Common	...	

Bluegills and largemouth bass were the most abundant game fish at the time of the survey. Certain years have produced good catches of northern pike. These variable crops of pike are probably determined by the fluctuating water level making spawning facilities more favorable in certain years (high water years).

Liberal plantings of largemouth bass, bluegills and perch have been made in recent years. The advisability of plantings such as these in a lake already producing these species by natural propagation is extremely doubtful.

Creel Census

The few creel census records taken on this lake by conservation officers indicate that largemouth bass and bluegills are the two game species most often taken.

Growth Rate of Game Species

The following table gives a summary of the growth rate data secured for the game fishes of Big Silver Lake.

Growth rate of game fish from Big Silver Lake

Species	Age group [✓]	Number of individuals	Av. total length (inches)	Av. weight (ounces)
Northern pike	I ^{**}	2	14.0	9.7
	II	6	18.5	15.3
	IV	2	25.6	43.5
Yellow perch	III	7	6.4	1.5
	IV	2	7.1	2.1
	V	4	7.6	2.8
Largemouth bass	II	2	6.6	2.1
	III	4	9.2	6.2
Bluegills	III	1	5.4	1.4
	IV	1	5.1	1.3
	V	2	5.9	2.1
	VI	3	7.0	3.8
	VII	2	10.3	8.3
	VIII	1	8.2	8.4
Pumpkinseed	IV	1	5.6	2.5
	VI	1	7.0	3.7
Warmouth bass	IV	2	4.5	1.2
	VIII	3	6.1	2.5
	IX	1	8.3	7.9

✓ Age determinations by W. C. Beckman.

**Number of Annuli. The fish of this survey were actually taken during June of the season following. Fish of the I age group are in their second summer of life, etc.

The series of scales collected for age determinations of the game fish is not very large and may not be exactly representative of the growth rate

for each species. However, we believe that these data show, in a general way, the condition for each species represented.

Northern pike from Big Silver Lake reached legal length (14 inches) early in their 2nd summer. This is about equal to the tentative state average. Yellow perch probably reach legal length (6 inches) early in their third summer. This is about a year behind the state average. Largemouth bass had only reached a total length of 9.2 inches at the beginning of their fourth summer, which probably means that this species is likewise one year behind the state average. Bluegills did not reach legal length (6 inches) until their 6th growing season--two years behind the state average. Seven-year-old (8th summer) bluegills, however, were 10 inches in length. The two pumpkinseeds seemed to be growing about the same rate as the bluegills, while warmouth bass were in their 9th summer before reaching 6 inches.

These studies indicate that northern pike is the only species whose growth rate is equal to the state average. The bluegills show signs of stunting, being two years behind the state average.

Natural Propagation

There is adequate, if not rather ideal spawning facilities for large- and smallmouth bass, perch, bluegills, and pumpkinseeds. Northern pike also find conditions good, especially if water levels are kept constant at the higher level.

Management Proposals

Designation of Lake

Big Silver Lake is in the category of "all other lakes" and the findings of this survey show no reason for a change.

W. C. Beckman, 1941. Age of fish upon reaching legal size in the inland lakes of Michigan. Institute Memoranda No. 124.

Stocking

No stocking of any species is recommended for this lake. The past plantings of perch, bass, and bluegills could have done little to supplement the already existing natural propagation. Evidence of slower than average growth indicates that there are already too many bass, perch, and bluegills in the lake. Northern pike should be encouraged by holding the water at a higher constant level and all predator control should cease. It is believed that an increase in pike might well reduce the pan fish population to where it will grow at an average rate.

Predators and Parasites

As already stated, the presence of a reasonable number of predators is probably beneficial to Big Silver Lake. We therefore recommend no control whatsoever.

Black spot, yellow grub and tapeworm cysts were found on bass and bluegills. These were not numerous and were doing no apparent harm. No control is practical or necessary. None of these parasites are capable of attacking man.

Shelter

There is adequate shelter in the already existing weed beds and no improvements are recommended.

Water Level Regulation

One of the most apparent improvements from the fisheries point of view is the maintenance of a constant high water level on Big Silver Lake. As pointed out previously in this report, this action should encourage pike by increasing and improving their spawning grounds. The increase in pike should help to restrict pan fish to where they will grow at a

faster rate. The fluctuation of the water level and possibly the continuous stocking of perch, bass, and bluegills may have been responsible for the present reported decline in fishing.

INSTITUTE FOR FISHERIES RESEARCH

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