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A FISHERIES SURVEY OF THE MANISTIQUE LAKES, LUCE AND MACKINAC COUNTIES

by

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The three lakes included in this report are North Manistique Lake (Round Lake), Manistique Lake (Big Manistique Lake), and South Manistique Lake (Whitefish Lake). Their locations are as follows:

Lake	County	Twp.	T.	R.	Towns and Roads
North Manistique	Luce	Lakefield	45 N.	11,12 W.	On M-98 at Helmer
Big Manistique	Mackinac	Portage	44 N.		
	Luce	Lakefield	45 N.	11,12 W.	On M-135 at Helmer
South Manistique	Mackinac	Newton	43 N.		
		Portage	44 N.	12 W.	On M-135 at Curtis

The relation of the lakes to the drainage of the area is shown in Fig. 1. North and South Manistique lakes each have several inlets; they each have one outlet which flows into Big Manistique, which in turn constitutes the headwaters of the Manistique River.

Maps showing the outline and soundings were prepared during the winter of 1935-1936 by the Michigan Emergency Conservation Work, Camp Newberry.

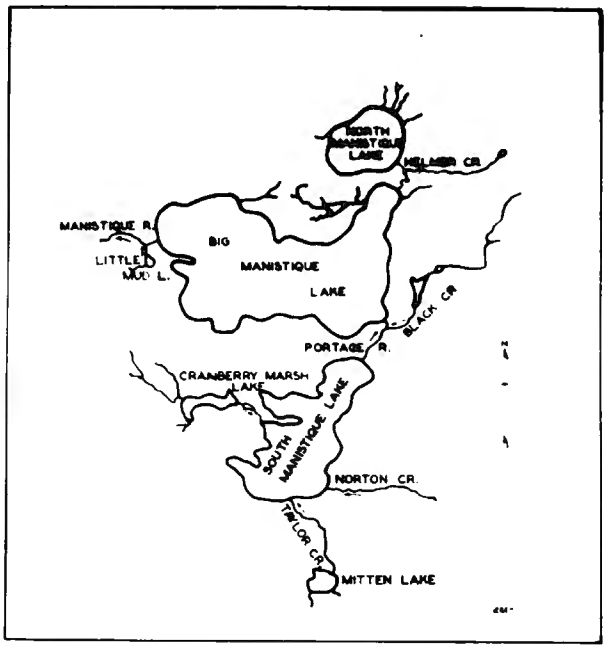

FIG. 1 SKETCH OF DRAINAGE - MANISTIQUE LAKES

Fig. 1. Sketch showing drainage of the Manistique Lakes.
(From Scott's "Inland Lakes of Michigan")

A biological survey was conducted by the Institute for Fisheries Research on North and Big Manistique lakes* during the summer of 1936 and on South Manistique Lake** in 1937. This included a study of the water (temperature, dissolved gases, hardness, etc.), fish foods, fish, vegetation, and bottom soils. Since the three lakes are close together and are in the same drainge, it is logical to cover them in a single report.

The early history of the lakes and their commercial relationships is rather vague. All three have been good fishing lakes, and still are, with the possible exception of South Manistique. Reports from this lake indicated a decrease in the take of nearly all species present. Migration of the fish out of the lake into Big Manistique and their failure to return has been a theory advanced by local residents. Northern pike and walleyes have been observed leaving the lake through Portage Creek. Whether or not this migration is responsible for the poor fishing can be determined only by further investigation. Reports during 1941, however, are to the effect that fishing has improved considerably.

Heavy fish mortalities have been reported at times on North and Big Manistique lakes. Many dead fish were found in North Manistique Lake in July 1930 and in Big Manistique Lake in July 1941. Examination of the fish in each case left the cause undetermined. Parasites were found but not in abundance; symptoms of disease were absent, although bacterial diseases are very difficult to diagnose when using dead or preserved specimens. Mr. L. N. Allison, who investigated Big Manistique Lake during

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* The party consisted of: D. E. Miller, leader; W. F. Carbine, and Mr. Erickson, assistants.

** The party consisted of: F. Bond, leader; W. C. Beckman and J. T. Greenbank, assistants.

the recent mortality, believes that the high temperature, coupled with an abnormally low water level, was responsible.

The Manistique Lakes are popular resort lakes; North had 2 resorts and a County Park; Big had 10 resorts, South had 5 resorts and one small town at the time of the survey. Cottages are numerous on Big and South Manistique lakes. Due to the large size, the variety of fishing, and the suitable shoreline, these lakes are excellent recreational areas.

The lakes lie in an interesting section of the Upper Peninsula. Their basins are situated in a large glacial deposit (moraine) which is unusually low and flat for this type of geologic feature. Small depressions and knobs provide most of the relief. Scott* states that originally the water level was 10-12 feet higher and the lakes were all combined. This gives some idea as to the relief of the surrounding country. The lake basin of Big Manistique, while lower than the surrounding area, has a similar topography. Small depressions form the deepest parts of the lake, while many small knobs form shallow areas and islands. South Manistique Lake's basin is more uniform--gradually deepening from the shore with no individual depressions and only one island. North Manistique is similar to South Manistique, except that the slope is much steeper and the lake is deeper.

The main drainage of the area is shown in Fig. 1. For a group of lakes as large as these, the drainage area is relatively small. Approximately 6 miles east of the lakes marks the extent of the Manistique River drainage system. Waters further east are accommodated on the north by the Tahquamenon River and on the south by small streams running into Lake Michigan.

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* I. D. Scott. 1920. Inland Lakes of Michigan. Pub. 30, Geol. Series 25, Mich. Geol. and Biol. Survey.

The watershed is basically level, interrupted by numerous small depressions and knobs.

Water fluctuation in the Manistique Lakes is a source of considerable concern. On large, shallow lakes such as Big and South Manistique lakes, the maintenance of a uniform or constant water level is extremely important from the standpoint of fisheries interests because spawning conditions and habitats for young fish are adversely affected. The lake frontage property value, of course, is also involved.

There is an old dam at the outlet of Big Manistique Lake but it is ineffective at present because the south end is open and free passage of water results. A dam has also been installed at the outlet of South Manistique Lake. This dam has not been operated according to a definite plan, with the result that the water level is not as well controlled as it might be. The outlet of North Manistique Lake is in such a position as to be subjected to considerable wave action. A natural sand bar has formed, limiting the flow of water and holding the water level of the lake up to a desirable position.

A summary of the physical characters of the three lakes is given in the following table.

	Area (acres)	Maximum depth (ft.)	% of shoal	Bottom types		Secchi disk (ft.)
				Shoal	Depths	
North	1,722	50	20	Sand, marl	Pulpy peat	6
Big	10,130	20	100*	Sand, pulpy peat		8
South	4,001	29	100*	Sand, pulpy peat		6

* While the entire lake bottom does not support vegetation, the depth factor is suitable for plant growth--so the entire lake is considered shoal.

Shallow lakes are, in general, more productive than are deeper lakes. However, Big and South Manistique lakes are unusually large, a character which is often coincident with lower productivity. In these lakes, the wind occasionally roughens the water to such an extent that the entire lake is roily. This is unfavorable for plant life, both because of shifting bottoms and poor light penetration. Plankton (small free-swimming animals and plants) is adversely affected through abrasion by small sand particles. Shifting bottoms brought about by wave action are also detrimental to the bottom fish food populations.

A knowledge of the temperature and chemical character of lakes is important because the plant and animal life are influenced by these factors. The following table summarizes such information from the Manistique lakes.

	Surface					Thermocline												Bottom					
						Top						Bottom											
	Temp. (°F.)	O_2 (p.p.m.)	CO_2 (p.p.m.)	M.O. Alk. (p.p.m.)	pH	Depth (ft.)	Temp. (°F.)	O_2 (p.p.m.)	CO_2 (p.p.m.)	M.O. Alk. (p.p.m.)	pH	Depth (ft.)	Temp. (°F.)	O_2 (p.p.m.)	CO_2 (p.p.m.)	M.O. Alk. (p.p.m.)	pH	Depth (ft.)	Temp. (°F.)	O_2 (p.p.m.)	CO_2 (p.p.m.)	M.O. Alk. (p.p.m.)	pH
North (7/13/36)	83	7.7	0.0	89	7.9	10	82	..	..	..	..	19	69	9.6	0.0	..	8.1	45	62	1.9	5	106	7.1
Big (8/13/36)	72	8.5	0.0	87	8.1	. .	. .	. .	.	No thermocline		. .	. .	. .	. .	. .	. .	16	69	9.1	0.0	88	8.1
South (9/9/37)	69	7.1	2.0	82	8.0	. .	. .	. .	.	No thermocline		. .	. .	. .	. .	. .	. .	24	67	7.4	2.5	82	7.8

As far as the temperature and chemical character of the water are concerned, the lakes are potentially productive. The waters promote good plankton growth. There is adequate oxygen at all depths in Big and South Manistique lakes, although it is quite probable that the waters near the bottom in North Manistique become stagnant late in the summer season. No thermocline (zone of rapid change of temperature) is present in Big and South Manistique because of their shallowness and large size. Wind action is able to keep the lake in a constant state of "turn-over."

The pH and hardness are well within the range of maximum potential productivity.

There is no evidence of pollution in these lakes. It is doubtful that domestic pollution would have a serious effect on the fisheries since the water is well aerated by constant mixing and the amount of pollution is relatively small.

With regard to vegetation, there are striking differences in kinds and amounts of plants present in the three lakes. Big and South would be expected to have similar plant growths due to the similarity in the shape of basin and type of bottom. However, there is a closer relationship between the vegetation of North and Big than South and Big. For example: Chara and sago pondweed are abundant in North and Big but absent in South; coontail is abundant in South but absent in the other two; wild rice is common in South and absent in North and Big. For a complete list of plants recorded during the survey, see the following table.

Common Name	Scientific Name	North	Big	South
Sweet flag	Acorus calamus	...	Rare	...
Waterweed	Anacharis canadensis	...	Rare	Few
Water shield	Brasenia Schreberi	...	...	Rare
Coontail	Ceratophyllum demersum	...	...	Abundant
Musk grass	Chara sp.	Abundant	Abundant	...
Spike rush	Eleocharis sp.	Rare	Rare	...
Mare's tail	Hippuris vulgaris	...	Rare	...
Iris	Iris versicolor	...	...	Rare
Duckweed	Lemna and/or Spirodela	...	...	Rare
Water marigold	Megalodonta Beckii	...	...	Rare
Water milfoil	Myriophyllum spicatum	...	Rare	Rare
Bushy pondweed	Najas flexilis	...	Few	...
White water lily	Nymphaea odorata	...	...	Few
Yellow water lily	Nuphar	...	Rare	Common
Reed grass	Phragmites	...	Rare	...
Pondweed	Potamogeton angustifolius	...	Rare	...
Pondweed	Potamogeton Friesii	...	Rare	Rare
Pondweed	Potamogeton gramineus	Rare	Few	Rare
Floating-leaf pondweed	Potamogeton natans	Few	Few	Few
Pondweed	Potamogeton nodosus	...	Rare	...
Sago pondweed	Potamogeton pectinatus	Common	Abundant	...
Pondweed	Potamogeton Richardsonnii	...	Few	Rare
Pondweed	Potamogeton Robbinsii	...	...	Rare
Pondweed	Potamogeton strictifolius	...	...	Rare
Pondweed	Potamogeton tenuifolius	...	Rare	...
White water buttercup	Ranunculus aquatilis	...	Rare	...
Stiff water crowfoot	Ranunculus longirostris	...	Rare	...
Widgeon grass	Ruppia maritima	...	Common	...
Arrowhead	Sagittaria cuneata	...	Rare	...
Arrowhead	Sagittaria latifolia	Rare	Rare	Few
Big bulrush	Scirpus acutus	Common	Abundant	Abundant
Three-square	Scirpus americanus	Rare	Rare	Rare
Bur-reed	Sparganium sp.	...	Rare	Rare
Cattail	Typha latifolia	...	Rare	Few
Bladderwort	Utricularia vulgaris var. americana	...	Rare	Rare
Wildcelery	Vallisneria americana	...	Few	...
Wild rice	Zizania aquatica	...	...	Common

Big Manistique Lake contains a wider variety of plants than does either of the others. This may be due, in part, to the fact that the other two lakes drain into it--each contributing seeds or vegetative parts of species not formerly present. In addition to a larger number of species, Big Manistique has the most extensive weed beds, some of which cover several hundred acres.

Plankton was not particularly abundant in any of the lakes at the time of the survey. In shallow lakes, which are subject to larger temperature changes, there is often considerable fluctuation in plankton populations. In the Manistique lakes, plant forms predominated.

Bottom organisms were found to be rather limited in numbers by the survey party. The samples were taken largely from the deeper water where bottom organisms are not usually abundant. Too, bottom samples are generally taken where there is little or no vegetation and in lakes subject to wave action, the bottom is quite unstable except where vegetation grows. This may account for the small numbers of organisms in the samples taken. No determinations were made of the abundance of fish foods harbored by the large weed beds but recent studies have shown that weed beds similar to those in Big and South Manistique lakes often support tremendous quantities of fish food. The small amount of vegetation in North Manistique Lake is offset by the construction of 200 brush shelters by the CCC (reported by Mr. Herman Ottenhoff). These undoubtedly provide good cover as well as large quantities of food.

At the time of the survey, an attempt was made to determine the relative abundance of the various species of fish in the three lakes. The following table is based on their findings. The total number of each game species planted during the period 1936-1939 40 inclusive is also shown.

Fish	North Manistique		Big Manistique		South Manistique	
	Abundance	Number planted 1936-40	Abundance	Number planted 1936-40	Abundance	Number planted 1936-40
GAME SPECIES						
Northern pike	...	...	Few	...	Rare	...
Yellow perch	Abundant	12,500	Abundant	36,000	Common	33,000
Walleye	Common	980,000 fry	Common	2,710,000 fry	Common	2,180,000 fry
Smallmouth bass	Few	...	Few	...	Few	...
Largemouth bass	...	...	...	...	Few	...
Green sunfish	...	...	Rare	...	...	...
Bluegill	...	...	...	...	Few	...
Pumpkinseed	...	...	Rare	...	Few	...
Rock bass	Few	...	Rare	...	Few	...
Cisco	Common	...	Few	...	Few	...
COARSE FISH						
Common sucker	Abundant	...	Common	...	Common	...
Mullet	Few	...	...	...	...	...
Brown bullhead	...	...	Few	...	Few	...
FORAGE FISH						
Mimic shiner	Few	...	Abundant	...	Few	...
Straw-colored shiner	Few	...	Abundant	...	Common	...
Blunt-nosed minnow	Abundant	...	Abundant	...	Common	...
Spot-tail minnow	...	...	Common	...	...	...
Mud minnow	...	...	...	...	...	...
Common shiner	...	...	Common	...	Abundant	...
Golden shiner	...	...	Rare	...	Few	...
Mud minnow	...	...	Rare	...	...	...
Muddler	...	...	Rare	...	Rare	...
Johnny darter	...	...	Common	...	Few	...
Iowa darter	...	...	Rare	...	...	...
Log perch	...	...	...	...	Few	...

Scale samples were taken and age determinations were made on all of the game fish taken. The results are given in the following table.

Fish	Age group*	North Manistique Lake		Big Manistique Lake		South Manistique Lake	
		No. of specimens	Average length (in.)	No. of specimens	Average length (in.)	No. of specimens	Average length (in.)
Yellow perch	I	5	3.6	...	...	...	...
	II	5	4.6	10	5.9	...	...
	III	43	6.1	7	6.9	...	...
	IV	34	7.3	4	8.8	1	6.1
	V	12	8.4	8	9.1	...	...
	VI	8	10.1	7	9.5	2	8.4
	VII	10	10.4	3	10.9	1	7.8
	VIII	13	9.8	...	...	...	...
	IX	21	10.4	...	...	...	...
	X	1	12.0	...	...	...	...
	XI	1	11.4	...	...	...	...
Walleyed pike	0	2	6.9	...	...	...	...
	I	10	9.7	...	...	1	10.3
	II	6	11.7	1	10.2	1	13.2
	III	3	18.1	4	14.1	3	15.5
	IV	9	14.0	9	13.7	12	16.0
	V	7	19.4	6	15.8	10	17.5
	VI	3	18.5	...	...	4	17.9
	VII	3	21.2	...	...	2	17.5
	VIII	2	19.8	...	...	...	...
Rock bass	I	1	2.4	...	...	...	...
	II	10	3.5	...	...	...	...
	III	25	4.8	...	...	...	...
	IV	67	6.4	...	...	2	7.4
	V	29	7.0	...	...	1	7.7
	VI	1	7.8	...	...	2	8.4
	VII	...	...	...	...	2	8.8
	VIII	...	...	...	...	2	8.1
	X	...	...	...	...	1	11.2
Northern pike	III	1	23.0	2	21.2	...	...
	IV	...	...	2	26.3	...	...
	VI	...	...	...	...	1	33.3
	VIII	...	...	1	38.5	...	...
	IX	...	...	1	45.0	...	...
Smallmouth bass	II	1	8.7	...	...	2	11.2
	III	12	11.2	...	...	...	...
	IV	2	15.0	...	...	1	14.3
Cisco	I	1	6.3	...	...	...	...
	II	13	8.0	...	...	...	...
	III	24	9.4	...	...	3	13.9
	IV	45	10.4	...	...	1	13.9
	V	36	10.9	...	...	...	...
	VI	9	11.4	...	...	1	16.6
	VII	4	11.8	...	...	3	16.8
Bluegill	II	2	4.0	...	...	...	...
	VI	2	7.5	...	...	...	...
	VII	1	7.7	...	...	...	...
Pumpkinseed	IV	1	7.0	...	...	...	...
	V	2	6.5	...	...	...	...
	VI	3	7.1	...	...	...	...
Largemouth bass	II	1	10.7	...	...	...	...

Fish	Age group*	North Manistique Lake No. of specimens	North Manistique Lake Average length (in.)	Big Manistique Lake No. of specimens	Big Manistique Lake Average length (in.)	South Manistique Lake No. of specimens	South Manistique Lake Average length (in.)
Largemouth bass	V	1	17.4	...	...	...	...
	IX	1	18.3	...	...	...	...
	XII	1	18.1	...	...	...	...

* Age determinations made by W. C. Beckman.

The perch in North Manistique Lake show rather slow growth, but other species seem to be growing at reasonable rates.

Management Suggestions

The lakes under discussion seem to have adequate food, cover, and spawning facilities for all game species present.

Perch are plentiful in all three lakes and natural propagation should easily maintain the status of this species. Further stocking is not recommended.

Walleyes are reported as common in all three lakes. All the lakes have received heavy plantings of walleye fry in the past. Since so little is known about the spawning of walleyes, the rather liberal planting of this species has never been questioned. It is possible that walleyes do not spawn in some lakes and that artificial plantings are responsible for their maintenance. On the other hand, natural propagation should not be overlooked since in most species it is entirely adequate to stock a lake to its maximum carrying capacity.

The Manistique lakes present an opportunity to test whether or not walleyes spawn in large lakes of this type. It is therefore recommended that no walleyes be planted in these lakes during 1942 and 1943. This will give a two-year period during which investigations can be made to determine the nature and extent of walleye spawning. Recommendations for

further stocking can be made following this investigation.

The lakes should continue to be classed as pike lakes.

The water level conditions in Big Manistique Lake require attention. A dam, placed in the outlet, which could be operated to hold a suitable water level should be installed. The dam at the outlet of South Manistique should be operated in conjunction with the one in Big Manistique.

The migration of fish from South Manistique Lake warrants investigation. It is recommended that several hundred migrating fish be fin-clipped and released. Results should show the extent to which fish leave the lake permanently, and the relative numbers returning after the spawning season.

There has been some local agitation to remove by netting suckers and ciscoes from South Manistique Lake. The relation between these species and the pike--both northern and walleyes--is not well understood at present. There is little direct evidence that suckers harm or benefit pike. It is possible, of course, that suckers may become too abundant, to the detriment of the game species, but until this condition develops or fishing becomes exceptionally poor, the wholesale removal of the coarse fish is not recommended. In the meantime, studies may show that these species constitute the major food of the pike, or perhaps we may find that pike feed on other fish to a greater extent. But until this relationship is determined and as long as fishing for pike is normal, the removal of suckers and ciscoes cannot be justified, at least on the basis of their harm to game species.

Predators and parasites are not of sufficient importance to require regulation.

INSTITUTE FOR FISHERIES RESEARCH

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