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SURVEY REPORT ON EAST TWIN LAKE

by

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East Twin Lake (T. 29 N., R. 1 E., Secs. 27, 28, 33, 34) is in the extreme southwest corner of Montmorency County, at the town of Lewiston. It lies in the valley of the Au Sable River and formerly had direct connection with that stream. An outlet from the southeast side of the lake entered Snyder Lake, and thence flowed into T-Lake, and into the East Branch of Big Creek, the latter entering the North Branch of the Au Sable near Lovells. This outlet was dammed about 1892 and since that time all traces have more or less disappeared. Later, a ditch was dug allowing the lake to drain into the outlet of West Twin Lake, which forms the West Branch of Big Creek. This drain was filled in, so at present the lake has no outlet. Other lakes, besides those which have been mentioned, which lie in the same basin but have no connection, are Big and Little Wolf Lakes.

The map (outline and soundings) was made by a crew from Camp Au Sable (CCC) in the winter of 1935-36. The ecological survey of the lake was made by the writer during the summer of 1939. The actual lake inventory work was done between August 17 and September 5. The rest of the summer was devoted to a fish population study of the lake which is discussed in detail in Institute Report No. 590.

East Twin Lake was formerly the site of a rather prosperous lumbering industry. A large saw mill and a planing mill occupied the northeast shore. These were in operation until 1910, with their greatest activity about 1900. At that time, Lewiston was a town of some 3,500 people. With the abandoning of the mills, the town decreased greatly in size, and only within the last three or four years has again grown somewhat because of the tourist trade. Its population now stands at about 300.

A little can be learned of the lake's early fishing history from some of the older residents. While the mills were in operation, the fishing seems to have been good, but the fish taken were different from those now present in the lake. Great northern pike were abundant, as were good sized perch. Large-mouthed bass, pumpkinseed sunfish, and rock bass were the other dominant game species. Brook trout seem to have been present in sufficient numbers to be important in the fisherman's "take." Bluegills were apparently absent. As for non-game species, the common sucker (C. commersonnii) probably was the most important. We could learn nothing of the presence of other coarse fish. Undoubtedly, there were some bullheads. Presumably, the fishing was good until 1915 and then seems to have dropped off, temporarily at least. Wall-eyed pike were introduced sometime after 1915 and began to show in the fishermen's catch about 1921. The fishing in the lake apparently reached another peak about 1926, but it is important to note here that at that time one species formed the main part of the catch, namely, the wall-eyed pike. It had become by far the dominant game species in the lake.

Since the introduction of the walleye, the population has changed greatly, either because of its presence or some other factor. Northern pike have disappeared along with the brook trout. Perch, though present in good numbers, are small in size. This, however, may be a temporary,

cyclic condition. The large-mouthed bass is present, but in limited numbers. Small-mouthed bass are said to have been introduced some years ago. It is possible this species may have been native to the lake but not distinguished from the large-mouth. Whatever the truth may be, this fish has apparently held its own. The rock bass and the pumpkinseed have also maintained themselves through natural propagation. The walleye is the dominant species at present, but its number is not large. The population study made this summer (Institute Report No. 590) showed about 4 adult wall-eyes to the acre, which does not seem a heavy population. All game and "coarse" species combined total about 11½ adult fish to the acre, and this again shows the population to be small, assuming that the estimates made are reasonably accurate. Inasmuch as few data are available as to just what constitutes a heavy or light population in Michigan lakes, it is difficult to say definitely that this population is light. However, since it shows less than 15 pounds to the acre, it does not seem heavy. The above figure, compared with figures given for other lakes, is certainly below average (see reports by Eschmeyer, 1937, 1938, 1939). The important game species are now: wall-eyed pike, pumpkinseed sunfish, small-mouthed bass, rock bass. Large-mouthed bass and sizable perch, though present, are very limited in numbers. According to residents, fishing has not been good in recent years. Whether this has been due to increased fishing pressure or to some other factor will be discussed later.

The resort development on the lake is moderate. About 35-45 cottages are present on its shores. Swimming is only fairly good because of the soft bottom which swimmers usually encounter at depths beyond about 4 feet. In a few places the sand extends to a greater depth, however. The lake is readily accessible from all directions. If the fishing could be improved through proper management, it should furnish an excellent public fishing ground for warm water species.

East Twin Lake has a basin which is roughly rectangular in shape, the long axis running in a N.W.-S.E. direction. The east bay is the only part of the lake which falls outside of the rectangle. The greatest length is about a mile and a half. The lake has a glacial origin, lying in the morainal outwash region of northern Michigan. The surrounding country is scrub oak, jack pine flat, typical of the northern part of the Lower Peninsula. The terain immediately surrounding the lake is wooded, except for the southeast shore which was cleared when the mills were running. The shores of the lake are sandy and clean except for the northwest end which is boggy, probably as a result of the filling of the ditch which was dug to meet the outlet of West Twin Lake. The water fluctuations are negligible. The absence of inlets our outlets plays an important role in maintaining the level. It drops about four inches in the course of the summer.

Table I

Physical Characters of East Twin Lake

Area in acres	974
Maximum depth	22 - 25 ?*
% of Shoal	70 - 80
Bottom types	
Shoal	Sand, gravel, peat
Deep	Peat, sand
Inlets-Outlets	None
Color of water	Colorless
Secchi disk	14' 6"

* CCC found 25 feet; I could find only 22.

The physical characters of a lake may have considerable importance in relation to fisheries. Plant growth, bottom food production, and spawning activities are all more or less dependent upon bottom types and the amount of shoal. Certain types of bottom are much more productive than others. Many fish find either gravel or plant growth essential to successful spawning. Forage fish are for the most part limited to the shoal areas. The lake under consideration has sufficient shoal to permit the growth of plants over almost the whole bottom. Such factors as area, water turbidity and color have a less direct effect on fish but are also important. A lake with a considerable area allows for wind and wave action, thereby making some of the shores more or less barren. Murky or dark brown water will not allow enough light penetration for successful plant growth. East Twin's 974 acres permit considerable wind sweep, and for that reason, in certain parts of the lake, notably along the south and east shores, wave action is considerable. Because the prevailing wind is from the north or west, it is these shores which bear the brunt of the wave action. However, since the drop-off is closer to shore on this side of the lake, the effect of wave action is noticeable for only a short distance out from shore. The water is clear enough to allow sufficient light penetration for a good growth of plants over most of the bottom.

The chemical characteristics of a lake are also extremely important in connection with general fishing conditions. Temperatures play an important role--various species having different requirements and all of them limited within certain ranges. The growth of fish is often directly influenced by temperatures. Temperature has a direct bearing on the dissolved oxygen retention of the water and hence on the fish themselves. Other chemical factors, as pH (alkalinity-acidity), M.O. (hardness), etc.,

have a direct effect on plant growth and an indirect effect on the fish. Extreme conditions would of course affect the fish directly. A tabulation of the temperatures and chemical factors for East Twin Lake follows.

Table II

Temperatures and Chemical Characters, East Twin Lake

Date	Depth	Temperature	Oxygen ppm.	CO_2 range	pH range	Pollution	Thermocline
9-5-39	0	65.8 F.	8.5	0.0	8.4	None	None
	11	...	8.5	0.0	8.2	None	None
	17	...	8.0	...	...	None	None
	20	67.6 F.	8.9	6.0	7.9	None	None

It will be noted that there was no thermocline (that layer of water in a lake where the temperature drops one degree Centigrade or more with each meter of depth) formed in the lake at the time the chemical anaylsis of the water in the lake was made. If this absence of a thermocline is a usual condition, it means that fish may be distributed throughout the lake the year around. Under these conditions the water will have approximately the same density throughout, enabling the oxygen laden water to mix with that which carries less oxygen. The table also shows a sufficient amount of dissolved oxygen from the top to the bottom to maintain life. The results of the tests for acidity-alkalinity indicate that the water is alkaline. Carbon-dioxide is not abundant. The methyl orange analysis for hardness is not included because of an error in titration. One analysis does not always furnish data sufficient to make any definite conclusions, and this summer (1940) seasonal analyses will be made.

The aquatic vegetation present in a lake plays a very important role in the general productivity of the water. It serves as shelter, and as the basic source of food. It furnishes spawning areas for certain species. East Twin Lake is well supplied with vegetation of certain types. There is little floating vegetation (water-lilies, etc.), except for that found in the northwest end, and in the little embayment behind the sand spit on the west shore. Emergent vegetation (bulrushes and cat-tails) is fairly abundant, rushes being found on all the protected shores and shoals, and cat-tails in the northwest corner. Submerged vegetation (pond-weeds, Chara, etc.) is generally distributed over the whole lake except on the wave swept sand bars and at the north end of the north bay, where the bottom is apparently unsuitable; probably because of the fact that pulpy peat when quite homogeneous is not conducive to plant growth. However, I should judge that fully 30-40 per cent of the bottom is covered with vegetation. As to the species present, little can be said since these have not been identified. At least two types of pond weeds (Potamogeton) are present, along with at least two species of reeds (Scirpus), both white and yellow water-lilies, cat-tails, Chara, and other plants. There are probably 20 species of plants present. In the writer's opinion the lake is adequately supplied with vegetation.

Fish foods may be divided into two classes: plankton (free floating or free swimming microscopic plants and animals, e.g. water bloom and water fleas), and bottom foods (larval insects, aquatic earthworms, crustaceans, and small clams or snails). The plankton samples taken were lost or mislaid. Plankton taken about the first of September was not abundant. Since this type of food varies greatly week by week, one sample is not significant. Collections of bottom food, made by the use of a clam shell type of dredge (Ekman), show that in this respect the lake is lacking. Collections were

made from all types of bottom at several depths: 1 and 1/2 feet on sand; 3 feet on pulpy peat; 6 feet on pulpy peat; 9 feet on pulpy peat and sand; and 18 feet on pulpy peat. Collections were attempted in fibrous peat, but the dredge would not close because of sticks, water-lily roots, etc. The same applies to collections attempted on gravel where the dredge would not operate properly. The only collection which showed bottom food in significant quantity was one made in 1 1/2 feet over sand. This yielded 0.4 cc in a square foot of bottom. The food was characterized by small midge larvae (Chironomidae), 112 in number. Other collections taken in the peat showed almost nothing: 1 pelecypod at 18 feet; 11 Corethra at 9 feet; 2 Corethra at 6 feet; 1 Hydracarina, 1 Corethra, and 2 oligochaetes at 3 feet. By way of conclusion we would judge that plankton and bottom food are not present in sufficient quantity, although considerable bottom food may be attached to plants.

The following table (III) gives some idea of the abundance of the various fish species in the lake. A total of 15 species were collected, which is about an average number for the lakes in the northern part of the state. The relative population percentages are derived from determinations made in the population study (Institute Report No. 590). It is interesting to note the absence of obnoxious fish, and the small population of coarse fish, except for the sucker, which is of course quite abundant.

Scale samples were taken from the various species in the lake. Age determinations have been made for the game species (Table IV). The samples taken from rock bass and perch are inadequate and these gaps will be filled next summer (1940). The growth of the game fish in the lake is rather good. The walleyes reach legal size in their third summer. Their growth as compared with fish from some of the other lakes in the same region (Black Lake, Cheboygan County and Long Lake, Alpena County) is at least average.

Table III

Table showing fish taken on East Twin Lake, 1939. Percentages are estimates of adult fish (game and coarse) of sufficient size to be taken in trap nets used. Forage fish estimates made from seining.

Species	Game Species	Forage	Coarse	"Obnoxious"	Stocking 1934-38, incl.
Walleyes	*/36%				3,510,000 fry
Perch	?				23,000 6-7 mo.
Small-mouth bass	*/17%				362 Legal, sub-legal (1939)
Sunfish (L.gibbosus)	*/23%				
Rock bass	*/9%				
Large-mouth bass	*/Less than 1%				
Bluntnosed minnow		****			
Spot tail shiner		**			
Mimic shiner		***			
Menona killifish		**			
Iowa darter		**			
Johnny darter		**			
Sucker			*/21%		
Brown bullhead)	*/				
) Less than 1%					
Yellow bullhead)					

*/ Coarse, game fish combined in relative population estimates.
**** = Dominant population of forage fish
*** = Abundant population of forage fish
** = Small

Table IV

Average standard and total lengths (mm. and inches) for the different age groups represented by game species in East Twin Lake. Figures in parentheses denote the number of specimens from which average was taken.

Species	0		I		II		III		IV		V		VI	
	S	T	S	T	S	T	S	T	S	T	S	T	S	T
Walleye	153 6 1/8 (1)	183 7 1/4	200 7 7/8 (1)	237 9 3/8	313 12 1/4 (45)	373 14 5/8	350 13 3/4 (29)	419 16 1/2	392 15 1/2 (17)	464 18 3/8	426 16 3/4 (3)	507 20		
Sunfish			57 2 1/4 (2)	71 2 3/4	100 4 (1)	127 5	143 5 3/4 (15)	177 7	164 6 1/2 (19)	204 8 1/8	174 6 7/8 (6)	216 8 1/2		
Smallmouth bass	68 2 3/4 (1)	83 3 1/4	87 3 1/2 (1)	105 4 1/4	215 8 1/2 (4)	257 10 1/8	245 9 3/4 (11)	302 12	267 10 1/2 (3)	331 13	345 13 5/8 (1)	430 17	335 13 1/4 (1)	415 16 3/8
Rock bass			64 2 5/8 (1)	79 3 1/8					168 6 5/8 (3)	208 8 1/4	175 7 (1)			
Perch					155 6 1/8 (2)	183 7 1/8	163 6 1/2 (1)	194 7 3/4	216 8 1/2 (1)	252 10				

Table V

*/ Average lengths in inches for wall-eyed pike from Long, Black, and East Twin lakes. Figures in parentheses denote number of specimens from which the average was derived.

	Black Lake		Long Lake		East Twin Lake	
	Standard Length	Total Length	Standard Length	Total Length	Standard Length	Total Length
I	8 (2)	9 1/2			7 7/8 (1)	9 3/8
II			7 (2)	8 1/2	12 1/4 (45)	14 5/8
III	15 1/2 (1)	18 1/4	12 1/4 (1)	14 3/8	13 3/4 (29)	16 1/2
IV	16 3/8 (4)	19 3/8	15 (1)	17 5/8	15 1/2 (17)	18 3/8
V	17 3/8 (3)	20 1/2	15 3/4 (1)	18 3/8	16 3/4 (3)	20

*/ Comparative material taken from data tabulated by W. C. Beckman.

The other game species in the lake also show reasonably good growth. The pumpkinseed reaches legal size in its fourth summer, which compared with the growth in lakes in the same region is average. The small-mouthed bass reaches legal size in its third summer, which again is average. The samples from rock bass and perch are inadequate though they also show fair growth.

In the management of a lake for fishing, a knowledge of the natural propagation of the game species present is of utmost importance. In order for a population to be maintained, either one of two things is necessary. Either the species under consideration must spawn successfully, or plantings of sufficient numbers must be made regularly. Little can be said concerning natural propagation in East Twin Lake. Vegetation is abundant, and perch should spawn successfully. Whether the wall-eye is able to reproduce is open to question. We have very little knowledge of its requirements for spawning. Gravel shoals are present on the southeast side of the lake. Inasmuch as black bass and sunfish have not been introduced in significant numbers in the past few years, the presence of fry would seem to indicate that they at least spawn successfully. Work this past summer was begun too late to observe actual spawning of centrarchid fishes (large- and small-mouthed bass, rock bass, and sunfish) but many fry were observed and some old nests were seen. Also the past history of the lake would indicate that these fish are able to maintain themselves.

In making suggestions for the actual management (designation, stocking, environmental control), one is faced with a very complex situation. The writer feels that the introduction of an undesirable species (for the particular water under consideration) has done more to spoil the fishing in East Twin Lake than any other single factor. The past fishing history somewhat bears this out. Brook trout probably disappeared with the warming of the water when the outlet was dammed and the timber cut. While other

species were present in large numbers, the wall-eyes apparently got along well. However, as other species declined in numbers the wall-eyes also decreased. Although theoretical circumstances seem to support this contention. West Twin Lake, similar in many respects, and differing chiefly, so far as can be learned, in that it has not been stocked with wall-eyes (other than a few which have been introduced by fishermen), continues to give good sport to the fishermen who choose to fish there rather than on East Twin.

Management Suggestions

1. Designation. East Twin is at present designated as a "pike lake." Pike lakes are designed to favor the predacious species (great northern pike, and wall-eye). In pike lakes in the Lower Peninsula, these species may be taken from May 15 to March 1. Since bass and sunfish in a pike lake may be subjected to fishing (though not legally kept) all through this period, it is obvious that lakes in which they thrive best should be in the "all other lakes" class. There is some indication that East Twin Lake may be better adapted to bass and sunfish than to wall-eyes. Further investigation this summer (1940) will help to decide whether or not the designation of East Twin Lake should be changed.

2. Stocking. Following a policy adopted by the Conservation Commission, bass and bluegills are not stocked in a pike lake. In consideration of the designation of East Twin Lake, it will be necessary to learn whether or not the wall-eye spawns in the lake. Consequently we are recommending that no wall-eye fry be stocked this spring (1940) so that through intensive seining we can learn if the wall-eye spawns in East Twin Lake. Secondly, in order to learn more of how bass become acclimated, it would be well to make another experimental planting of adult small-mouth bass. These will be tagged so that a record can be kept of their movements, growth, and survival. The planting should be made early in June if possible, so results

may be obtained through creel census.

3. Creel census. A creel census will be conducted this season to learn if possible just what are the actual fishing conditions in the lake at present, and the yearly harvest. Winter fishing, as judged from the results of my own effort for a period of about three weeks, is not good. In this period only 5 wall-eyes and 3 perch were taken. As a test, five to seven lines baited with blunt-nosed minnows were fished continuously. Different parts of the lake at different depths were tried, but the fishing remained extremely slow.

4. Predators. Predators on the lake are few. This past summer three great blue herons, one osprey, and one bald eagle were observed. Perhaps 20 gulls are present on the lake most of the time, but they should be considered as scavengers rather than predators. We do not think that the few predators mentioned are of any great potential danger, and unless their numbers should greatly increase, control measures do not seem advisable.

5. Parasites. Parasites in the fish from East Twin Lake are not numerous; "black spots" were observed in the bass and sunfish but not a heavy infestation, and tapeworms were found in the wall-eyes. The suckers in the lake present something of a problem. They have presumably been abundant through the years. Apparently, a periodic mortality occurs, involving the suckers in both East and West Twin lakes. The cause of this mortality seems to be a bacterial gill disease (see Institute Report No. 167). This periodic mortality, in addition to removal by netting, probably has reduced the population considerably from time to time. The question immediately arises as to whether this reduction is a beneficial thing for the lake. The suggestion has been made that this decimation of the population might possibly account for the poor production of fish now. However, it will require considerable investigation (stomach analysis especially) to bear this out.

6. Environmental Control. Shelter is adequate, abundant vegetation and numerous dead-heads being present. The presence of extensive gravel shoals should furnish sufficient spawning grounds. No recommendations for spawning boxes or brush shelters are made. The water level is quite constant, except for very minor fluctuations.

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