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Title

TREATMENT OF
REPORT ON TREFRY'S LAKE, YARMOUTH COUNTY, N. S., WITH COPPER
SULPHATE.

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REPORT ON
TREATMENT OF TREFRY'S LAKE, YARMOUTH COUNTY, N.S., WITH
COPPER SULPHATE

Upon petition of the Yarmouth branch of the Nova Scotia Fish and Game Protective Association, the Fish Culture branch of the Department of Fisheries treated Trefry's lake with copper sulphate. The primary purpose of this treatment was to destroy the existing fish population, which was considered inimical to future successful stocking with brook trout. The operations and the scientific investigations were carried out under our direction with the assistance and co-operation of Mr. F. A. Tingley, Mr. A. P. Hills and the staff of the Yarmouth Fish Hatchery. Certain members of the Yarmouth branch of the Fish and Game Protective Association gave assistance in various matters connected with the work.

Observations were made upon the lake from August 2nd to 14th inclusive, 1938.

Characteristics of the lake in brief.

The system consists of only the lake, one small inlet, and one outlet, which after a short run joins another small stream just above tide water. The area of the lake, as determined by Mr. D. S. Wickwire from a stadia survey, is 53.26 acres. The maximum sounded depth is forty-three feet. The average depth of water has been estimated from the Wickwire survey at 13.5 feet. The volume has also been estimated from this survey as 31,084,000 cubic feet. Practically all of the foreshore

is composed of gravel, boulders and bed-rock. An ooze containing much organic matter predominates over the lake bottom.

The waters of the lake become definitely stratified during the summer months as illustrated in Table 1. On August 4, 1938, a decline in temperature from five to seven metres of 5.3°C was encountered (thermocline). This stratification has a decided effect upon the dissolved oxygen content of the waters below the thermocline, where the amount is decreased to very near, or below, that required by fish life. Thus for several months of the year a considerable volume of the lake is probably not inhabited by fish, except for sporadic incursions.

The bottom fauna was investigated at eighteen stations by the use of an Ekman dredge and sorting screens. Plankton samples were taken at three stations by a plankton trap. Each metre interval of depth was sampled at each station. Net hauls were made at the surface. These hauls indicated that the zooplankton in particular was rather poor as compared to that found in other lakes in the region at that time of year. Most of the samples have not been worked over so it is impossible to present more precise information at this time.

Beds of rooted emergent aquatic vegetation are limited in extent. Thus the elaboration of fundamental food stuffs in the lake from this type of vegetation is restricted in quantity.

Treatment with copper sulphate

The lake was treated with copper sulphate on August 6th. Four boats and ten men were engaged in the operations. The time

consumed for the treatment was a little over seven hours, from 9:30 a.m. to 12:20 p.m. and from 1:00 to 5:25 p.m. Distribution was made by towing the copper sulphate contained in coarse gunny sacks from outriggers placed across the stern of each boat. Due to the depth of water and the stratification of the waters, and thus a restricted circulation, it was deemed advisable to administer some of the copper sulphate at or just below the thermocline in order to expedite the distribution. Accordingly, about 700 pounds was distributed by towing the sacks at about twenty-five feet over the deeper area of the lake. Since a large number of fish appear to seek the shoal water on shore when affected by the copper sulphate, the peripheral zone was thoroughly treated by towing sacks around the entire shore line in shallow water.

Altogether 6,048 pounds of copper sulphate were distributed in the lake. This amount gives an estimated dosage of 3.04 p.p.m. of copper sulphate as $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

Results

A certain number of fish, particularly gaspereaux, were beginning to die by 3:00 p.m. in the treated portions of the lake. Nine species of fish were found to be present in the lake, namely Ameiurus nebulosus (catfish or bullhead), Anguilla rostrata (eel), Fundulus diaphanus Killifish), Morone americana (white perch), Notemigonus crysoleucas (golden shiner),

Osmerus mordax (smelt), Perca flavescens (yellow perch), Pomolobus pseudoharengus (alewife or gaspereau), and Fungitius pungitius (nine-spined stickleback). Table 11 shows the relative abundance of the several species. In addition this table presents an estimation of the total number in the lake, number per acre, total weight in the lake and pounds of fish per acre. This estimation was made by enumerating the fish on 21.8 per cent of the total shore line and from weighing a sample collected on one section of the shore. This sample consisted of 1,469 specimens.

No fish survivors were noted. However, no netting or other means were employed to ascertain if any fish actually survived the treatment.

As in other lakes treated with copper sulphate the plankton fauna and bottom organisms were destroyed.

Analysis of the water.

A number of water samples were collected for analysis of the copper content. No analysis has yet been made.

Discussion

Almost half of the fish production in pounds per acre consisted of white perch. In view of these findings the treatment was justified if planting with trout fry or fingerlings was contemplated as a stocking policy for this lake. On the other hand, a considerable food supply for older trout existed

in the form of killifish, young gaspereaux, and particularly young smelts. Killifish customarily frequent the littoral zone and in this fashion evade capture by predators, but gaspereaux and smelts inhabit, as a rule, the same zones of a lake as older trout. Thus the question is raised as to whether a better procedure in the case of Trefry's lake would not have been a stocking with yearling trout. The white perch would compete with the yearling trout for the same food supply, but the existence of populations of young gaspereaux and smelts indicates that the white perch had by no means depleted this important food supply. The situation was such that yearling trout would have found the conditions suitable, as far as food is concerned, and there would appear to have been fair chances that yearling trout would have dominated the other predators, providing always that adequate protection was provided from angling until they were established.

The possibility that stocking Trefry's lake with yearling trout would have been a better policy than destroying the entire fish population and subsequently planting with trout fry or fingerlings indicates that caution is required in utilizing the poisoning method for eradicating fish in order to rehabilitate trout habitats. It is not questioned that in some cases this method appears to be the only one indicated. Such a case is lake Jesse, in which the balance between predator and non-predator was quite different from that in

Trefry's. A more intensive survey of a lake for which the poisoning method is contemplated is required in order that desirable populations are not destroyed, although on first appearances these populations are quite undesirable from the viewpoint of stocking with trout. The presence of gaspereau and smelt was apparently not appreciated until Trefry's lake was treated. More precise information upon the status of the existing fish population, especially the inter-relations between species as well as the species present, seems essential before the procedure is altogether justified. Stocking with older fish may prove a less expensive method where adequate investigation indicates such a procedure.

M. W. Smith.

October 28th., 1936.

TABLE 1. TEMPERATURE, DISSOLVED OXYGEN CONTENT AND pH VALUE OF THE WATER IN TREPHY'S LAKE, AUGUST 4, 1938, STATION 1.

Depth in metres.	Temperature °C.	Dissolved oxygen content		pH value
		c.c. per litre	% saturation	
0	25.9	5.81	97.6	6.3
1	25.85			
2	22.2			
3	21.15	5.80	90.0	
4	20.3			
5	19.1	5.45	81.6	6.1
6	<u>18.85</u>			6.0
7	<u>18.8</u>	5.20	70.3	5.9
8	12.55			
9	11.95	3.88	50.5	5.8
10	11.55			
11	11.3	3.27	42.0	
12	11.2			
12.75	11.2	2.54	32.5	5.7

TABLE 11. STATISTICS ON THE FISH POPULATION OF TRAPPY'S LAKE.

Species	Number in lake	Number in sample	Number per acre	Weight in lake	Pounds per acre	Average weight
<u>Ameiurus</u> (cutfish)	770	37	15	77.0 lb.	1.5	48.0 gm.
<u>Anguilla</u> (eel)	5942	134	51	149.5	2.6	19.5
<u>Fundulus</u> (killifish)	8759	452	164	69.5	1.3	3.6
<u>Micropterus</u> (white perch)	11761	449	331	456.4	8.6	17.6
<u>Notemmalosa</u> (golden shiner)	841	15	15	51.5	3.5	37.55
<u>Gambusia</u> (molt)	4454	314	95	31.7	0.4	3.2
<u>Perca</u> (yellow perch)	1380	15	35	71.5	1.3	33.9
<u>Pomoxis</u> (spargan)	4546	194	88	51.2	1.0	5.4
<u>Punctilus</u> (stickleback)	9	--	--	--	--	--
TOTALS	53517	1469	440	209.5 lb.	17.7	