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LAKE TROUT PLANTING EXPERIMENT IN THE GREAT LAKES—REPORT OF ACTIVITIES BY INSTITUTE FOR FISHERIES RESEARCH DURING 1948.

Activities were as follows:

a) Fingerling Lake Trout Marking, 1948

Following the plan of marking distinctively at least 10 percent of the current plantings of fingerling lake trout in Michigan waters of the Great Lakes, a group of 22,606 lake trout fingerlings from the Charlevoix Hatchery of the U. S. Fish and Wildlife Service were marked by removal of the left pelvic fin and planted in northwestern Lake Huron on September 29, 1948. The fin-clipping was done by a state crew in charge of Ora Corbett. The 1948 operation is the fifth of a series of yearly marked plantings begun in 1944. In 1944, 1945, and 1946, approximately 10 percent of the plantings of fingerling lake trout were marked in accordance with experimental plans drawn up by the Lake Trout Committee. This general plan has been followed for the year 1947, and again in 1948 for releases in Lake Huron, since the Service wished to operate the Charlevoix station and since the fish could not be transported to Lake Superior. If any extensive movement of planted lake trout occurs through the Straits, the marking done in both of the Great Lakes should reveal it. The purpose of the marking work is to determine by recoveries of marked fish in subsequent years the proportion of the commercial catch which is later made up of artificially

reared lake trout fingerlings. Also it will be possible to add to our knowledge of growth and migration of this important commercial species through recaptures of the marked fish at different sizes in their life span.

The 1948 marking operations were conducted at the U. S. Fish and Wildlife Station at Charlevoix during the period September 14-17 under the supervision of O. M. Corbett, Fisheries Research Technician B, of the Institute for Fisheries Research. He was assisted by Arthur DeClaire, Fisheries Research Technician B, also of the Institute, and Hugo Hall and Harry Runyon of the State Fish Hatchery at Oden, Michigan.

The lake trout fingerlings planted in 1948 were made distinguishable from plantings of the previous years by the removal of the left pelvic fin. Small curved blade manicure shears (with blades approximately 5/8 inch long and tapering from 1/8 inch to the point) were used for clipping. As in past years a weak solution of ether (1/4 ounce of ether to one quart of water) was utilized to inactivate the fish while marking them.

The number of fish marked daily and the subsequent mortalities observed are presented in Table 1. A total of 104 man hours was expended in the marking operation, and also to measure a random sample of 500 fin-clipped fish for determination of average total length and average weight. The lake trout fingerlings marked ranged between 53 and 84 millimeters in total length. The average total length of the 500 fish measured was 70.2 millimeters, and their average weight was 2.4 grams.

The total observed mortality during the 1948 marking amounted to 58 fish (0.26 percent). Of this total, 39, or 0.17 percent, were noted immediately following the clipping operation. Deaths 24 or more hours later amounted to 18 fish (0.08 percent) and two fish (0.01 percent) were killed in the planting operation. No fish were held for control experiments on this particular marking, as no pond space was available. Also, it was felt

Table 1

Number of fingerling lake trout marked daily, and subsequent mortality observed, 1948 marking (left pelvic fin clipped), Charlevoix Station, U. S. Fish and Wildlife Service.

Date	Trough Number	Number of fish Marked	Clip Mortality	Number Surviving	24-hour Mortality	Number Surviving	Post-24-hour mortality	Number Available for Planting
Sept.14,1948	7-8 upper	8,498	22	8,476	1	8,475	7	8,468
Sept.15,1948	7-8 lower	7,209	14	7,195	...	7,195	6	7,189
Sept.16,1948	9-10 upper	6,958	3	6,955	1	6,954	3	6,951
Totals		22,665	39	22,626	2	22,624	16	22,608 1/

1/ - Two fish were killed during transfer operations for planting, so the total left pelvic-marked lake trout fingerlings released in Lake Huron on September 29 may be set at 22,606.

that there would be no significant difference in the results from the 1947 experiment in which right pelvic-clipped fish are being held for observation.

On September 29, 1948, a total of 22,606 marked lake trout fingerlings were planted in northwestern Lake Huron from Patrol Boat Number 1 under the direction of Captain Charles J. Allers. The fish were transported by tank truck from Charlevoix to Alpena, where they were transferred to aerated tanks aboard the patrol boat. The planting site was approximately four miles southeast of Scarecrow Island, about 16 miles southeast of Alpena.

Abnormalities of fins noted among the 22,665 lake trout fingerlings handled during the 1948 fin-clipping operations were as follows: left pelvic fin missing---one fish; three pelvic fins present (the third one usually smaller and in the mid ventral plane)---104 fish.

We wish to acknowledge our gratitude to the U. S. Fish and Wildlife Service for the sleeping accommodations made available through the cooperation of the foreman of the Charlevoix Station, Mr. Harold Roth. Also, we are indebted to District Fisheries Supervisor H. L. Thompson for providing the services of two of his staff to aid in the marking work.
Report submitted by David S. Shetter.

b) Marking Experiment

As in previous years since September, 1944, semi-annual inspections of the control experiments retained at the State Fish Hatchery at Marquette, Michigan, were made in March and October of 1948. At each examination all experimental fish present are measured individually and weighed in groups, and the regeneration controls inspected to determine the amount and progress of regeneration. The results concerning mortality and growth are presented in Table 1.

Table 1

Summary of Mortality-Growth experiments on lake trout fingerlings, as of October, 1948, Marquette State Fish Hatchery

All experiments were started in September of the various years.

Item	1944		1945		1946		1947	
	Normal	Dorsal-adipose clip	Normal	Right pectoral clip	Normal	Left pectoral clip	Normal	Right pelvic clip
Present at start	2,000	2,007	1,000	1,001	1,000	1,000	1,000	1,000
Present Oct. 1948	239	200	429 1/	378 1/	267	196	877	794
Average size at start								
Total length (in mm.)	74.6	73.5	81.9	81.5	80.6	81.9	73.1	73.8
Weight (in grams)	3.4	3.1	4.8	4.6	4.01	4.01	2.9	2.9
Average size Oct. 1948								
Total length (in mm.)	422	422	295 1/	298 1/	259	257	174	175
Weight (in pounds)	1.38	1.41	0.48	0.49	0.31	0.31	0.10	0.09

1/ - Counts and measurements, May, 1948, before planting out in Shupac Lake, Crawford County.

The greatest mortality differential between marked and normal fish appears to be present in the early years of life, as it will be observed that there is a progressively smaller difference between the percentages of survival of marked and normal fish in the experiments which have been operating longer.

Although the information available pertaining to the comparative growth of clipped fish and normal fish have not been subjected to statistical treatment, the average sizes and average weights of marked and unmarked fish suggest there is little if any difference in the rate of growth of the marked and unmarked fish under hatchery conditions.

Concerning regeneration of the various marks used, examination of the 1944 (dorsal-adipose clip) mark in March, 1946, indicated that 90.4 percent of the dorsal-adipose-clipped fish were easily recognizable as such, and this experiment was closed to provide pond space for the oncoming control experiments. Information on the 1945, 1946, and 1947 regeneration experiments is given in Table 2. The 1945 regeneration experiment (right pectoral fin), when last examined in March of 1947 consisted of 294 fish. Of this number 284, or 96.6 percent had regeneration estimated to be one-half or less. This regeneration experiment was accordingly ended in the spring of 1947.

The 1946 regeneration group (left pectoral mark) was last examined in March, 1948. At that time 175 fish were present, and of this number, 157 (89.7 percent) showed regeneration amounting to one-half or less. These fish were released for planting in inland waters in the summer of 1948.

The regeneration experiments on the 1944, 1945, and 1946 marks which were used in the Lake Michigan plantings would indicate that approximately 90 percent at least are considered to be easily recognizable since they have regenerated no more than one-half of the fin or fins removed.

Table 2

Summary of regeneration experiments on lake trout fingerlings held at State Fish Hatchery, Marquette, Michigan, as of last examinations. All groups had 500 fish at the start. Percentages are given in parentheses.

Item	1945 Right pectoral	1946 Left pectoral	1947 Right pelvic
Last examined	3/4/47 1/	3/10/48 2/	10/7/48
Number present	294	175	405
Amount of regeneration			
0	233 (79)	76 (43)	35 (9)
1/4	40 (14)	53 (31)	117 (29)
1/2	11 (4)	28 (16)	111 (27)
3/4	7 (2)	9 (5)	77 (19)
Full	3 (1)	9 (5)	65 (16)

1/ - Experiment concluded, spring, 1947.

2/ - Experiment concluded, summer, 1948.

Unfortunately this does not appear to be true for the 1947 regeneration experiment (right pelvic clip) for the planting in Lake Huron. Of 405 fish present in October, 1948, only 263 (or 64.9 percent) had one-half or less regeneration. Only 35 (about 9 percent) of these fish showed a perfect clipping job (0 regeneration) and 65 (about 16 percent) were complete "messes." The reasons for this poor job of marking appear to be as follows:

1. The relatively small size and the position on the body of the pelvic fins, making for a difficult clipping operation;

2. The marking crew was under pressure to meet a deadline for transporting and planting the fish.

In the future, if the pelvic fins are to be used as marks, the fish should average at least 100 millimeters in total length. On any marking work, the planting and transportation should be arranged to give the marking crew all the time necessary to do a thorough job of the marking.

In October, 1948, at the suggestion of Dr. W. E. Ricker, experiments were initiated to determine the effects of predation on fin-clipped lake trout fingerlings. Two ponds at the Marquette Hatchery were made available, and experiments involving clipped and normal fish in the presence of adult predator species were started. In the circular display pond, 4,000 normal lake trout fingerlings and 1,000 each of fingerlings marked by clipping each of the four fin or fin combinations previously used were placed with two adults of brook, brown, rainbow, and lake trout. A 12.5 percent random sample of the fingerlings were measured to determine average size, and all predators were weighed and measured. In one of the smaller ponds, the water area was divided by fine mesh screen placed on sheet piling. The upper half was left in the more or less open, normal condition of the usual hatchery pond, and the lower portion was given some escape cover in the form of several piles of rubble and small brush shelters. Into each half of the pond, 1,000 lake trout fingerlings were placed, divided as

follows: normal fish, 500, 125 each of dorsal-adipose clipped, left pectoral-clipped, right pectoral-clipped, and right pelvic-clipped fingerlings. Into each half of the pond, one adult brook trout and one adult lake trout were placed. All fish in this experiment were measured individually. The fingerlings were weighed by groups according to their mark. In the split pond experiment, the pond was covered with chicken wire to eliminate unknown losses by bird predation.

Daily records of dead fish found in all ponds are kept so that presumably only losses due to fish predation will be available from the various inspection counts. It is planned to examine these ponds as frequently as time permits during 1949, as well as to continue the examination of the remaining control experiments.

Report submitted by David S. Shetter

c) Recoveries of Marked Fish From Lake Michigan

As in the past two years the presence of marked lake trout was advertised to all commercial fishermen in Michigan by posting reward placards in all fish houses, fishing boats, and at docks along Lake Michigan. Articles in Michigan Conservation, The Fisherman, and in Department news releases and radio broadcasts were also used to acquaint the public with the experiment and need for reporting the capture of lake trout with missing or deformed fins.

Reports and specimens of fin-clipped lake trout recovered from Lake Michigan by commercial fishermen were received and sent in by Michigan conservation officers. For 1948 we received 288 reports from officers dealing with lake trout with clipped or deformed fins from Lake Michigan. These included 58 fin scars (37 of which came from legal fish) sent to the Institute, 3 fin scars not submitted to the Institute, and 227 fish (one was a legal fish) which were shipped by express to us.

From a tentative summary of the 288 reports, it appears that 225 are valid recoveries of marked hatchery fish (10 dorsal adipose clipped fish, 206 right pectoral clipped fish, and 9 left pectoral clipped fish). The remaining 63 fish are doubtful cases, most of which are legal-size lake trout from localities some distance from Beaver, Fox, and Manitou islands.

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INSTITUTE FOR FISHERIES RESEARCH

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