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MARKING FINGERLING LAKE TROUT USED FOR EXPERIMENTAL PLANTING IN LAKE MICHIGAN AND FOR CONTROL EXPERIMENTS

by

David S. Shetter

At the April, 1944 conference of the Great Lakes Lake Trout Committee it was agreed that Michigan should take the lead this year in arranging for the marking of lake trout fingerlings held at the Charlevoix Hatchery. The Wisconsin Department was to furnish assistance in the work. The author was assigned the responsibility of organizing and supervising the program.

Marking operations were initiated on Wednesday, September 6 and were completed September 18, 1944. The crew assembled on the afternoon of the previous day. The marking crew consisted of the following individuals:

From Michigan:
Dr. David S. Shetter, Associate Aquatic Biologist
O. M. Corbett, Fisheries Technician
Robert Barber, Fisheries Technician

From Wisconsin:
D. John O'Donnell, Area Biologist
Elmer Herman, Area Biologist

These men worked during the entire marking operation. We were assisted for two days by Dr. Edward Schneberger, Superintendant of Fisheries for

Wisconsin, and Matt Patterson, Supervisor of Commercial Fishing Operations for Wisconsin. On a basis of man-days of labor furnished, Michigan furnished 29 1/2 man-days of labor from the start of operations through the completion of the planting operations, and Wisconsin contributed 22 man-days.

The Mark used, method of operation

The method of making the 1944-planted fish distinguishable in the future was the removal of the adipose and dorsal fins. These fins were snipped off flush with the dorsal surface of the lake trout fingerling or even a small amount of the black flesh removed along with the fins.

Heavy, curved blade manicure shears were used as clipping tools. Such models as Wiss 663 1/2, La Cross 332-100, and similar shears manufactured by Revlon and other companies, were found to be good clipping shears.

None of the crew had ever attempted as large a fin-clipping job as was contemplated here. The first method tried was to fill a square tub with a 1 per cent solution of ether to anaesthetize the fish, which permitted more rapid handling in the clipping operation. One man sat at each corner of the tub. Two other tubs containing fresh water were placed on opposite sides of the square tub, into which the clippers tossed the marked fish. The fifth individual continually brought unmarked fish to the etherized tub, and removed marked fish from the fresh-water tubs to a holding trough previously prepared.

This did not seem to go fast enough. The next step was to employ a small dishpan for the ether solution and keep the fish to be marked in a scap net near the surface of the solution so that the clippers did not have to reach so far into the tub. It now appeared that we could eliminate some of the handling (which took up the time of one man) if the fish were clipped from one tank to another. Five washbasins were purchased, one

for each operator for holding the ether solutions. These were placed on screens or boards over the trough of fish to be marked. The fish were scapped into the ether solution from 12-50 at a time depending on the strength of the solution, were marked, and tossed into an adjoining tank from which all fish were previously removed. By this method, four men were able to mark 11,000 or more fish each day. The time of the fifth man was taken up by counting the previous day's clipping, measuring fish for the control experiments, recording mortalities and possibly working in an hour or two of clipping.

Counting was done by means of scapping the fish from one trough to another, a few at a time. The count was tallied by hundreds. One man could usually count the previous day's clipping in about 4 1/2 to 5 hours. He could seldom count over 4,000 fish per hour and the average was around 3,000 fish. A flat, tight scap was found to be the best type of net for this work.

Number of fish handled, mortalities

A tabular summary of the number of fish handled daily, with the attendant mortalities, and the number of marked fish withdrawn from the daily clip for the experimental controls, is shown in Table 1. A total of 105,349 lake trout fingerlings were clipped. The total number of fingerlings drawn from the Charlevoix Hatchery for the planting and experimental controls was 106,849 (1,500 unmarked fish were needed in the control experiment for comparative mortality between marked and unmarked fish).

After each day's clipping was completed, the number of dead fish was counted and removed from the trough. These fish had died usually because of too long exposure to the anaesthetic. Such exposure resulted

from holding too many fish for marking when the solution was fresh, or immediately after it was strengthened (the ether would evaporate, and it was also being continually diluted when a fresh lot of unmarked fish were added by scap net). Other causes of mortality were those incurred in scapping and handling, which contributed to the daily "clip" mortality. The clip mortality was tabulated by trough batteries containing varied and widely different numbers of fish, and varied between 3 in 3,803 marked fish to 81 in 6,994 marked fish. For the entire operation, mortality ascribed to clipping amounted to 488 fish out of 105,349 marked, or 0.46 per cent.

Mortalities which had occurred up to 24 hours later and post-24 hour mortalities were also tabulated. Some of these deaths undoubtedly were the result of the clipping and handling which were not severe enough to cause immediate death; others were known to be the result of jumping out of the tanks over the jump-boards. The 24-hour mortality amounted to 1,191, and ranged between 0 in 3,097 marked fish and 40 in 8,243 marked fish. The total would have been over 1,000 less had the author not forgotten to re-open the water tap after counting Trough 25-26. Some 1,024 marked fish died because of oxygen depletion.

Post 24-hour mortalities amounted to 301 marked fish, and varied between 0 in 8,203 marked specimens and 80 in 3,938 fin-clipped fish. Many of the post-24 hour mortalities could be ascribed to the fish jumping over the sides or out of the ends of the troughs. Another year complete covers will be provided for all troughs containing marked fish.

A total of 3,010 marked fish were utilized in the two control experiments. The removal of these, plus the various mortalities, left a total of 100,359 lake trout fingerlings delivered to the Patrol Boat

Number 1, which served as the planting unit. On the three trips made by this boat with marked fish, a total of 79 marked fish died as the result of scapping and handling. Thus the total number of fish released alive in the lake was 100,280 (100,359 less 79 planting deaths).

The control experiments

Two experiments have been set up, one to determine the comparative growth and mortality between marked and unmarked fish, the other to determine the amount of fin regeneration which may take place. In the first experiment, 2,007 marked and 2,000 unmarked fish have been set aside and will be placed in the same pond at the Marquette State Fish Hatchery. Five hundred of each type were measured and weighed. The average total length and the average weight of the unmarked fish was 74.63 millimeters and 3.38 grams; of the marked fish, 73.48 millimeters and 3.06 grams.

For the study of regeneration, 200 fin-clipped fish were measured and weighed individually and 803 more fish were scaped at random from the marked fish available.

In setting up the control experiments, an effort was made to secure a random sample from each day's clipping. Measurements were made on fish from 11 of the 19 troughs, and specimens for use in the control experiments were taken from 17 of the 19 troughs. Samples from about 98,000 of the 105,000 fish clipped are therefore included in control experiments. In taking the fish from the troughs for the control experiments, dips of the scap were made through all parts of the trough until the desired number was obtained. As the reader will note, a higher than average percentage of fish for the control experiments were taken from the clippings of September 11-16. This was because we did not anticipate such early planting by the Patrol Boat. The data pertaining to the control experiments will be found in Table 2.

The planting operations

Patrol Boat Number 1 of the Michigan Department of Conservation was used to distribute the marked fish. This is a Diesel-powered boat 75 feet in length, 17 feet in beam, with a 9 foot draft. The crew of the Patrol Boat consists of Capt. C. Allers, E. Belfy, E. Pischner, and Richard Lahti.

The rack of a stake-hoist automotive planting unit from the Oden Hatchery was securely roped to the after deck of the Patrol Boat. This assembly consists of four tanks and the circulating water-pump (American Marsh Redi-Prime) to keep the carrying tanks continually aereated.

The operational procedure was as follows: The holding tanks on the after deck were first filled about half full of fresh water, 100 pounds of ice added to each of the four tanks, and the water-circulating pump started. The fish were then transferred from the hatchery to the boat by pails, (about 700 fish to a pail). Approximately 10,000 fish were carried successfully in each tank. The water in the tanks started out at 59° F., and was not noted to rise beyond 61° F. on any trip.

On arriving at the planting locality, which was approximately three hours run, the boat was slowed down to barely steerage way. The fish were planted by placing them in a large wooded washtub to which there was connected about 15 feet of smooth black rubber fire hose about 3 inches in diameter. The tub was first filled with water and a satisfactory current started, then the fish were scapped from the tank into the tub. The current either sucked them down or they followed it of their own volition. On reaching the lake water they spewed from the hose in all directions, but in general scattered out and downward. A few were noted to stay near the surface in their original burst of swimming, but after progressing 50 feet or more these too would start for the bottom.

All of the plantings were made in relatively good mild weather, and on the leeward side of the Fox Islands in about 4-6 fathoms of water. On the day the author accompanied the planting boat (September 18, 1944) the air was 70° F., Lake Michigan 63° F., the tanks after planting, 61°F. The planting data will be found in Table 3.

Freak Fin combinations observed

In the course of the marking operations, everyone connected with the work kept tract of irregularities noted among the fish handled. The following abnormalities were brought to light: Sixteen fish were found which had no adipose fin; one fish was found which had neither dorsal nor adipose fin; one fish was observed which had three pelvic fins; and another fingerling lake trout was noted to have a well developed fin ray in the adipose fin.

SUMMARY

1. With the aid of ether as the anaesthetizing agent, and with heavy curved-blade manicure shears as tools, a total of 105,349 lake trout fingerlings which averaged slightly less than 3 inches in total length, were marked by removal of the adipose and dorsal fins in about 53 man-days of labor between September 6-16, 1944, (1,988 per 8 hour man day, 248 per hour, 4.1 per minute).

2. Control experiments were set up at the same time to determine comparative mortality and growth between marked and unmarked fish, and also to determine the amount of fin regeneration. These experimental fish will be held at the Marquette State Hatchery.

3. Three plantings were made by the Patrol Boat of the Michigan Department of Conservation. The total number of fish planted alive was 100,280.

ACKNOWLEDGMENTS

The writer, on behalf of the marking crew, wishes to express his appreciation for the help and cooperation received from C. F. Culler, Supervisor of Region 3, Superintendant Widmyer of the Northville Fisheries Station, and E. M. Geer, Foreman of the Charlevoix Hatchery--all of the U. S. Fish and Wildlife Service--for making living and working facilities available to us, as well as supplying the experimental fish.

Members of the Patrol Boat, and also Emerson Kreig, of the Oden Hatchery, also cooperated by keeping count of the mortality incurred in planting, and furnished details of the planting locality.

Thanks are also due to H. L. Thompson, Supervisor of the State Fish Hatchery at Oden, Michigan, for various assistance preceding and during the course of the marking.

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Table 1

Summary of Fin-Clipping Operations on Fingerling Lake Trout at

Charlevoix Hatchery, September 6-16, 1944--Dorsal and Adipose Fin Clipped

Trough number	Number clipped	Clip mortality	Total alive after clip	Removed for control	Left for planting	24 hour mortality	Post 24 hour mortality	Final total for planting	Number planted alive	Date clipped or planted
71-72	6,182	40	6,142	70	6,072	3	22	6,047		Sept. 6
69-70	4,481	40	4,441	70	4,371	3	52	4,316		Sept. 6
67-68	5,961	21	5,940	70	5,870	6	15	5,849		Sept. 7
65-66	2,556	5	2,551	70	2,481	4	11	2,466		Sept. 7
21-22	5,841	41	5,800	70	5,730	5	12	5,713		Sept. 8
19-20	6,204	17	6,187	50	6,137	27	18	6,092		Sept. 8
17-18	2,701	6	2,695	...	2,695	2	14	2,679		Sept. 9
1st planting								33,162	33,144	9/12/44
15-16	7,307	41	7,266	270	6,996	5	27	6,964		Sept. 11
13-14	6,928	72	6,856	270	6,586	5	15	6,566		Sept. 11
25-26	5,242	10	5,232	270	4,962	[1] 1,024	80	3,858		Sept. 12
27-28	6,610	4	6,606	270	6,336	23	17	6,296		Sept. 12
11-12	3,803	3	3,800	210	3,590	2	3	3,585		Sept. 13
31-32	7,544	53	7,491	270	7,221	23	10	7,188		Sept. 13
29-30	7,325	8	7,317	210	7,107	6	...	7,101		Sept. 14
2nd planting								41,558	41,526	9/16/44
33-34	5,163	9	5,154	210	4,944	4	2	4,938		Sept. 14
35-36	2,923	3	2,920	210	2,710	6	1	2,703		Sept. 14
37-38	8,459	6	8,453	210	8,243	40	...	8,203		Sept. 15
39-40	6,994	81	6,913	210	6,703	3	2	6,698		Sept. 15
- 53	3,125	28	3,097	...	3,097	...	...	3,097		Sept. 16
3rd planting								25,639	25,610	9/18/44
Totals	105,349	488	104,861	3,010	101,851	1,191	301	100,359	100,280	

[1] Heavy loss accounted for by oxygen deficiency

Table 2

Control Experiments on Comparative Growth and Mortality and on Fin Regeneration of Lake Trout Fingerlings on which Dorsal and Adipose Fins were Clipped, September, 1944
(Measurements are in millimeters, weights are in grams)

	Mortality					Regeneration		
	Unmarked fish		Marked fish		Total	Marked measured	Marked Unmeasured	Totals
	Measured	Unmeasured	Measured	Unmeasured				
Number	500	1,500	500	1,507	4,007	200	803	1,003
Av. total length	74.63	...	73.48	...	...	73.51	...	...
Av. weight	3.38	...	3.06	...	...	3.20	...	...

Table 3

Planting Record

Fingerling Lake Trout - Dorsal and Adipose Marks - Charlevoix Hatchery

Date	Number delivered to planting boat	Mortality on planting boat	Number alive at release	Location of planting in Lake Michigan
Sept. 12, 1944	33,162	18	33,144	S.E. Corner of N. Fox Island, 1/4 mile off shore- 30 ft. depth
Sept. 16, 1944	41,558	32	41,526	N.W. Shore of S. Fox Island, 1/2 mile off shore- 24 ft. deep
Sept. 18, 1944	25,639	29	25,610	N.W. Shore of S. Fox Island, 1/2 mile off shore- 24 ft. deep
Total	100,359	79	100,280	