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A report on the survival of trout in Clear Lake,
Riding Mountain National Park, Manitoba

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INTRODUCTION

Clear Lake is an area of water of approximately nine and one-half square miles located in townships 19 and 20, ranges 18 and 19 west of principal meridian, in Riding Mountain National Park, Manitoba. It is essentially a clear water lake, located on a plateau and receiving little drainage; its water is on the alkaline side of neutrality, depths up to 102 have been recorded, with an average depth of 43 feet, and it is moderately productive in bottom fauna and has a meagre animal plankton (Rawson). The bottom of the lake is mostly gravel and sand, and areas of emergent and submerged vegetation are limited.

The native fishes prominently include whitefish, tullibee, common sucker, perch and jackfish. Owing to the resort development about the lake, it was considered desirable to establish additional species of fish having more appeal to anglers.

RAINBOW TROUT

Following a survey by Bajkov in 1932, and upon the recommendation of Rawson after his survey in 1935, it was decided to attempt the introduction of rainbow trout in Clear Lake. Fry, hatched at Banff, were delivered to ponds at Clear Lake in June or July, reared, and planted in September. Approximately 140,000 fingerlings were released from 1937 to 1940; the trout reared through the summer of 1941 were held over to the spring of 1942 when 11,063 were planted, and an additional 13,942 fingerlings were reared in the summer of 1942 and set free

in the autumn. Therefore, it is reported that about 165,000 rainbow trout were introduced into Clear Lake between 1937 and 1942.

Efforts were made to determine the success of these plantings. Between October 23 and November 4, 1940, the late Dr. H. Rogers, limnologist for the Parks Bureau, made 11 settings of a gang of gill nets consisting of 100 feet of each of $1\frac{1}{2}$ ", 2", and 3" mesh in several locations in the lake. He caught 80 tullibee, 21 whitefish, 37 perch, 5 jackfish, 2 suckers, and 0 trout. Dr. Rogers made 40 hauls with a small mesh seine 50' by 4' and secured, among other fishes, 2 rainbow trout of 54 mm. and 55 mm. lengths. Several 3-year-old fish were reportedly taken by anglers in 1940. When the water was released from the rearing ponds in the spring of 1940 several 1-, 2-, and 3-year rainbow trout, amounting to about a pailful, came up into the freshet. One small trout was found in the town water tower when it was being cleaned out in the autumn.

Between May 7 and June 9, 1942, Dr. D. S. Rawson of the University of Saskatchewan, made an additional examination of the area. Efforts to detect the presence of spawning runs of rainbow trout in tributary streams, both by trapping in the streams and by the use of gill nets off their mouths, resulted in the taking of no trout. Using gill nets of meshes from $1\frac{1}{2}$ " to $5\frac{1}{2}$ ", settings were made in many different parts of the lake; two 150-yard gangs were lifted almost daily, and the catch from 16 settings totalled 836 perch, 662 whitefish, 922 suckers, 208 jackfish, 155 tullibee, and 0 trout. Hauls were made 43 times with a large minnow seine,

catching large numbers of spot-tailed minnows, perch, suckers, dace, darters, sticklebacks, and 3 young trout; of the latter, two were from the planting made in 1942, and the third was about 4 inches in length and probably had survived from a previous planting. Dr. Rawson recommended that further planting of rainbow trout be discontinued. He further recommended that efforts should be made to establish lake trout in Clear Lake.

LAKE TROUT

Following Dr. Rawson's recommendation that lake trout be planted in Clear Lake, it was decided that this not be undertaken in 1942. Lake trout fry had been introduced in 1926, 1929 and 1930 with no tangible results; owing to transportation difficulties, it is reported that the fry were not in good condition at the time, and many had died before planting. However, in 1943 arrangements were made between the National Parks Bureau, the Manitoba Department of Mines and Natural Resources, and the Canadian National Railways, for the free delivery of adult lake trout from Clearwater Lake, mile 18 on the Hudson Bay railway, to Clear Lake, via The Pas and Dauphin. In September of 1943, 274 adult lake trout were released alive in Clear Lake; within 2 days of their liberation at the east end, about 4 lake trout were taken by commercial fishermen operating whitefish nets at the west end of the lake. Fishing operations concluded at the end of September, so that no more trout were taken. In September of 1944, 296 live adult lake trout were planted in Clear Lake. A lake trout was

taken by an angler in September, 1944, and in the same month Mr. Hugh Fowler saw lake trout in shallow water, perhaps spawning or about to do so. Efforts were made to obtain lake trout eggs by pumping from the bottom of the lake in February, 1945, with no positive results. Arrangements are being made for the transfer of additional adult lake trout to Clear Lake in September, 1945.

COMMERCIAL FISHING

For several summers a licensee was given permission to fish gill nets in Clear Lake for the taking of fish, mostly whitefish, for sale to summer visitors at the townsite. Also commercial fishing was permitted in the winter of 1942-43, and in the summer of 1943 for unrestricted sale. The fish of greatest commercial importance was the whitefish and 74,100 pounds were reported taken from the summer of 1941 through the end of the summer fishing in 1943. The imposition of regulations requiring the licensee to catch a poundage of suckers equal to one-third that of the whitefish taken, and to set a proportion of small mesh nets for perch and tullibee, resulted in nets of many sizes being set in many locations. During this period of intensive netting, from the autumn of 1942 to the end of the summer of 1943, no rainbow trout were taken.

1945 EXAMINATION

Efforts were again made to determine the success of previous fish cultural operations at Clear Lake, and netting and seining was carried out in the period from July 18 to 29, 1945.

A gang of gill nets, consisting of 90 yards of $4\frac{1}{4}$ -inch mesh, 50 yards of $2\frac{1}{2}$, and 50 yards of $1\frac{1}{2}$ -inch mesh, was lifted 7 times from different locations in Clear Lake, at depths of 3 to 100 feet. Seining, with 4' x 6' minnow seine, was done at the cold stream flowing into the east end of the lake, at the stream at the rearing ponds on the north shore, and at the outlet stream on the west side of the lake. Observations, which were facilitated by good light, clear water, a boat and motor, and calm weather, were made in the west end of the lake.

GILL NETTING

The 7 lifts yielded a catch of 8 lake trout, 84 whitefish, 100 tullibee, 2 jackfish, 350 perch and 14 suckers. The lake trout were all taken at depths of 90 to 100 feet, and were between 5 and 8 pounds in weight. Six of the trout were returned to the lake apparently uninjured, and two were taken ashore for examination. Both trout were mature males; one was $22\frac{1}{4}$ inches in length, weighed 5 pounds, and its stomach contained a 8-inch tullibee; the other was $23\frac{1}{2}$ inches in length, weighed 6 pounds, 7 ounces, and its stomach contained a 6-inch tullibee. All lake trout had small heads, seemed to be fat, and were silvery with bluish-green markings. The flesh of the two individuals examined was whitish, with some suggestion of orange.

Whitefish were not taken at depths of less than 50 feet, and specimens between 8 and 18 inches in length were obtained. All of the individuals $13\frac{1}{2}$ inches and longer were sexually mature or maturing, and probably would spawn in the autumn. There was 1 male to 1.3 females. The fish were fat, with small heads and

heavy bodies, of light color, and good appearance. This is in contrast to earlier statements about poor-looking whitefish. It will be of interest to compare their growth rate at present, after the intensive fishing in 1943, and the rate of growth previous to exploitation.

No special effort was made to take jackfish. Two were taken in shallow water; they weighed 6 lbs. 12 oz. and 6lbs. 13 oz., at lengths of $30\frac{3}{4}$ and $28\frac{3}{4}$ inches respectively. The stomach of one was empty, and that of the other contained two perch of $5\frac{1}{2}$ and $4\frac{3}{4}$ inches in length.

No tullibee were taken in depths of less than 50 feet, as was the case for whitefish. Most of the tullibee were 6 to 10 inches in length, and were evidently mature at about 7 inches. Specific identification has not yet been determined, but it is agreed with Dr. Rawson that these fish do not look like the larger, deeper tullibee of many other lakes.

Perch were caught of lengths from 5 to 7 inches in the $1\frac{1}{2}$ -inch net, and 8 to 10 inches in the $2\frac{1}{2}$ -inch gill net. The stomachs of the larger individuals contained only fish remains, identified as C. cognatus, N. hudsonius, and P. flavescens.

Suckers did not appear in catches from depth of over 50 feet, nor in the abundance reported by previous investigators and fishermen.

SEINING

Seining was undertaken at three places at Clear Lake. It seemed self-evident that in midsummer there would be little

chance of locating trout except in cool water or in fast water. Accordingly, attention was given to the two cold inflowing streams and the lake shore in the vicinity, and to Wasamin Creek at the outlet of Clear Lake.

The stream at the rearing ponds is divided into two channels entering Clear Lake, and 2½ hours of seining yielded sticklebacks, sculpins, sucker, fathead minnows, and no trout. Seining at the stream at the east end of the lake, near the Park Superintendent's residence, gave a catch of sucker adults and fry, sculpin, perch, dace, spot-tailed minnow; fathead minnows and Iowa darters were taken along the lakeshore near the mouth of the stream. The outlet stream of Clear Lake was about 10-15 feet in width, fast flowing, and about one foot in average depth; seine catches were composed of sticklebacks, sculpins, fathead minnows, spot-tail minnows, perch, dace and no trout. The outlet dam was no longer functional.

OBSERVATIONS

Perch were most commonly observed in the water of Clear Lake. Schools of them were particularly frequent among the vegetation in the bay bounded on the west by the government pier. In the early morning, before the area was disturbed by swimmers, the fish frequently rose to the surface to take insects, mostly adult mayflies. That perch were also feeding on fish, as evidenced by the contents of a few stomachs previously referred to, was substantiated by the observation of their attacks on a procession of sticklebacks along a gravelly shore; in a continuous ribbon about

two feet in width, the sticklebacks had not all passed the observation point after $1\frac{1}{2}$ hours. As evening approached the perch came into water about 10 inches in depth and fed actively upon the sticklebacks, momentarily destroying the formation which immediately regrouped.

Jackfish were readily visible in water up to 10 feet in depth in the northwest portion of the lake. Observation from an outboard motorboat proceeding at slow speed along the edges of the reed beds revealed 14 jackfish, estimated at between 2 and 15 pounds, in about one mile of travel.

There was every evidence that jackfish had access to South Lake, and probably had easier entrance early in the spring before the aquatic vegetation filled the channel. A slight current was flowing into Clear Lake at this point, but no fish were observed.

The water level of Clear Lake was reportedly two to three feet higher in the summer of 1945 than in some previous seasons, and the reefs in the west end of the lake were all submerged.

PARASITES IN WHITEFISH

The whitefish and tullibee in Clear Lake carry cysts of the tapeworm Triaenophorus crassus in their flesh. In 1935 Dr. Rawson reported that "about one-half of the specimens (whitefish) examined were parasitized by the larvae of the tapeworm Triaenophorus robustus and in about $1/5$ the parasitism was very severe, 5 to 20 cysts per fish." T. crassus is synonymous with T. robustus. In March, 1943, in his report on commercial fishing operations just

concluded, Mr. Brownridge reported to Mr. Heaslip, Park Superintendent, "the percentage of parasites in all the whitefish we have examined has been from 50 to 60 per cent; half of these have been bad, the rest with just a few".

Sixty-six whitefish between 12 and 18 inches in length, and mostly from $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds in weight, were cut in a test for parasitization, between July 21 and 27, 1945. Of this number, 10 were free of cysts, and the remaining 85 per cent. contained from 1 to $5\frac{1}{4}$ each. There were 530.3 cysts per 100 whitefish, or 300.6 cysts per 100 pounds of whitefish. This is a very high degree of infestation, and, in spite of their general good appearance, the whitefish from Clear Lake could not obtain certification for inter-provincial or international shipment.

Although the whitefish have parasites in the flesh which render them unfit for export, under existing pure food laws, the production of this species in Clear Lake need not be altogether unutilized. Eggs produced from these fish would be quite healthy, insofar as any effect of T. grassus is concerned, and could not propagate the tapeworm. It is suggested that the whitefish of Clear Lake be used as a source of supply for spawn. Perhaps, in exchange for the adult lake trout currently being supplied, the Manitoba Department of Mines and Natural Resources might wish to conduct spawn-taking operations on whitefish at Clear Lake. The whitefish caught and used for this purpose might well be utilized in various woods camps in Riding Mountain National Park.

SUMMARY

1. The need for adequate game fishing in Clear Lake, Riding Mountain National Park, was early recognized, and surveys were conducted to determine the character of the lake and to formulate a fish cultural policy.

2. Between 1937 and 1942 a total of approximately 165,000 rainbow trout, nearly all fingerlings, were planted in Clear Lake.

3. In 1940 and 1942 serious efforts were made to check on the survival of the rainbow trout, using gill nets and seines, and only 5 small trout were taken. In 1940 some trout were caught in the stream below the rearing ponds, during an artificial freshet. Unverified reports of sight records of rainbow trout in the lake cannot be relied upon.

4. A total of 570 live adult lake trout were released in Clear Lake in the autumns of 1943 and 1944. A very few have been taken by anglers, and some were seen in shallow water in September of 1944. No direct evidence of their having spawned is yet available.

5. For several summers a restricted summer fishery for whitefish was operated at Clear Lake, and through the winter of 1942-43 and in the summer of 1943 this fishery was much expanded. About 100,000 pounds of fish were taken in the last year of operations (1942-43) including 66,000 pounds of whitefish, and nets of mesh small enough to take perch and tullibee were also in use. No rainbow trout and only four lake trout were caught.

6. Gill netting between July 18 and 29, 1945, in various parts of the lake and with nets of $4\frac{1}{4}$ -, $2\frac{1}{2}$ -, and $1\frac{1}{2}$ - inch mesh, resulted in the catching of 8 adult lake trout, 84 whitefish, 100 tullibee, 2 jackfish, 350 perch and 14 suckers. No rainbow trout were secured.

7. Seining at two cold tributary streams, and at the outlet of Clear Lake, yielded catches of sticklebacks, sculpins, suckers, perch, dace, fathead and spot-tail minnows, and darters. No trout were taken.

8. Observations indicated jackfish to be most numerous in the reed beds at the northwest end of the lake, that perch were very common and fed to a large extent on other small fishes, and that the water level of Clear Lake was now higher than in earlier drouth years.

9. There was a mid-summer separation of some of the species of fish in Clear Lake, the lake trout, whitefish and tullibee living at depths of 50 to 100 feet, and perch, suckers, and jackfish in shallower water.

10. The whitefish of Clear Lake are heavily parasitized by cysts of the tapeworm Triacnophorus crassus. In a sample of 66 fish, only 10 were free of cysts, and the remainder had from 1 to $5\frac{1}{4}$ each. There were 300.6 cysts per 100 pounds of whitefish.

CONCLUSIONS

1. There is still a considerable need of better angling in Clear Lake, Riding Mountain National Park.

2. The attempt to establish rainbow trout in Clear Lake has not met with success.

3. The attempt to establish lake trout, by the introduction of adult fish, shows every promise of success. However, there is as yet no proof that these fish have reproduced.

4. Whitefish in Clear Lake are too heavily parasitized to allow them to enter the export commercial trade.

RECOMMENDATION

It is recommended:

1. That the transfer of adult lake trout to Clear Lake be continued in 1945 and 1946, at about the same rate of stocking as in the past two years, and that no other species of fish should be currently introduced into the lake.

2. That small mesh gill nets be used in Clear Lake, on a test basis, in the summer of 1947 to determine the presence of young lake trout resulting from possible natural reproduction in the autumns of 1944-46. During the test, enough large mesh netting should be done to verify the presence of adult lake trout, if such seems advisable at that time.

3. That, as soon as natural reproduction of the lake trout has been established, angling for them should be permitted on a moderate scale.

4. That commercial gill netting should not be permitted in Clear Lake because (a) the whitefish are too heavily parasitized for export and (b) there would be too much interference with the lake trout which should be reserved for sport fishing only.

5. That the whitefish resources of Clear Lake be partially

utilized by government-operated spawn taking, either for the benefit of the National Parks Bureau or by the provincial government of Manitoba.

Table 1. List of common and scientific names of fishes referred to in this report.

<u>Common name</u>	<u>Scientific name</u>
tullibee or cisco	<u>Leucichthys</u> sp.
whitefish	<u>Coregonus clupeaformis</u>
rainbow trout	<u>Salmo gairdnerii</u>
lake trout	<u>Cristivomer namaycush</u>
sucker	<u>Catostomus commersonii</u>
dace	<u>Rhinichthys atratulus</u>
spot-tail minnow	<u>Notropis hudsonius</u>
fathead minnow	<u>Pimephales promelas</u>
jackfish or pike	<u>Esox lucius</u>
perch	<u>Perca flavescens</u>
Iowa darter	<u>Poecilichthys exilis</u>
sculpin	<u>Cottus cognatus</u>
brook stickleback	<u>Eucalia inconstans</u>

Table 2. A list of gill net catches made in Clear Lake, Riding Mountain National Park.

Number of fish caught

Date 1945	Location	Depth (feet)	White-fish	Tull-ibee	Jack-fish	Perch	Suckers	Lake Trout	Total
July 20	east end, off stream mouth	3-30			2	40	3		45
July 21	$\frac{1}{4}$ mile north gov't pier	50	6	2		60	2		70
July 23	$1\frac{1}{2}$ mile N.W. pier	90	14	10				1	25
July 24	1 mile north pier	100	42	17				7	66
July 25	200 yards off mouth stream at rearing ponds	20				179	9		188
July 26	north side narrows leading into east arm	30-75	8	3		71			82
July 27	$\frac{1}{4}$ mile north church camp point	60-80	14	68					82
Totals			84	100	2	350	14	8	558

Table 3. A list of seine catches made at Clear Lake, Riding Mountain National Park.

Location	Sucker	Dace	Spot-tail minnow	Fat-head minnow	Perch	Darter	Sculpin	Stickle-back
Stream, at rearing ponds	1			3			23	60
Stream and lake at east end	6	1	1	37	4	2	1	
Stream, at outlet of Clear Lake		1	2	2	1		4	17

Central Biological Station, Winnipeg, Manitoba

Fisheries Research Board of Canada

Surveys of whitefish infestation

Lake CLEAR (Riding Mountain Range... 19 W. prin. Tp. 19.....

Province Manitoba..... Date July 21-27, 1945.

Lengths	Number of cysts																			Totals
	0	1	2	3	4	5	6	7	8	9	10	11	14	39	54	19	21			
12-12 $\frac{1}{2}$			1																1	
13-13 $\frac{1}{2}$				3		1				1	1								6	
14-14 $\frac{1}{2}$		2	2	1	1	4	2	1			1			1					15	
15-15 $\frac{1}{2}$	4	3	4	4	3				1	1		1	1		1				23	
16-16 $\frac{1}{2}$	2	1	3		3	2			1								1	1	14	
17-17 $\frac{1}{2}$	4		2																6	
18-18 $\frac{1}{2}$			1																1	
19-19 $\frac{1}{2}$																				
20-20 $\frac{1}{2}$																				
21-21 $\frac{1}{2}$																				
22-22 $\frac{1}{2}$																				
23-23 $\frac{1}{2}$																				
24-24 $\frac{1}{2}$																				
Totals	10	6	13	8	7	7	2	1	2	2	2	1	1	1	1	1	1	1	66	
%																				
No. cysts	0	6	26	24	28	35	12	7	16	18	20	11	14	39	54	19	21		350	

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Surveys of whitefish infestation

Lake CLEAR (Riding Mountain) Range... 19 W. Riv. Tp. 19

Province.. Manitoba..... Date.. July 21-27, 1945...

Weights	Number of Fish	Number infested	% infested	Pounds	Number of cysts	Number of cysts/100 fish	Number of cysts/100 lbs.
0-8 to 15	2	2		1.75	12		
1-0 to 1-7	19	19		24.06	85		
1-8 to 1-15	26	22		44.38	180		
2-0 to 2-7	15	10		34.87	67		
2-8 to 2-15	3	2		8.06	4		
3-0 to 3-7	1	1		3.31	2		
3-8 to 3-15							
4-0 to 4-7							
4-8 to 4-15							
5-0 to 5-7							
5-8 to 5-15							
6-0 to 6-7							
6-8 to 6-15							
7-0 to 7-7							
7-8 to 7-15							
8-0 to 8-7							
8-8 to 8-15							
9-0 to 9-7							
9-8 to 9-15							
TOTALS	66	56	84.8	116.43	350	530.3	300.6

