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Title

Recoveries of whitefish tagged
at the Dauphin River, 1938

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INTRODUCTION

Between October 27 and November 14, 1938, the late David Hinks tagged and released alive 2,003 Lake Winnipeg whitefish, Coregonus clupeaformis into Lake Winnipeg at the mouth of the Dauphin River. Through the courtesy of the Department of Mines and Natural Resources of the Manitoba Government the records of the tagging operations and of the subsequent recoveries of tags were made available to the Central Station of the Fisheries Research Board of Canada. It seems fitting that an analysis of these important data should produce the first in what is expected to be a series of manuscript reports on Lake Winnipeg.

Mr. George Butler, present Supervisor of Sport Fishing and Fish Culture for the Manitoba Government, who was in charge of the Dauphin River Fish Hatchery when the fish were being tagged, drew our attention to these records and supplied much valuable information while they were being analysed.

RECOVERING THE TAGS

Most of the tags were recovered through the commercial fishery. No rewards were offered for their return. In general, local fisheries officers collected the tags from the fishermen and recorded the pertinent information. Probably at least half of the tagged fish caught were actually reported.

The most intensive fishery for whitefish on Lake Winnipeg takes place during the summer by boats based at ports along the east shore of the whitefish grounds, and on George Island, Little George Island, Cannibal Island and Sandy Island, which lie in that order in a line roughly northwest and southeast. There is a minor winter fishery through the ice in Kinnow Bay, in Sturgeon Bay and along most of the west shore north of Sturgeon Bay. Whitefish are rarely taken at other parts of Lake Winnipeg during the winter. The winter fishery starts soon after freeze-up, that is, shortly after the end of the spawning season.

Of the 2,003 tagged fish released alive, 125 were recorded as recaptured. The exact place of recovery was recorded for 56. These places are indicated on the map of the whitefish grounds of Lake Winnipeg shown in Figure 1. The points of recovery appear to form groups, and these groups are the basis for dividing the lake into the areas shown in Figure 1.

In all but one of the 69 cases where the exact location of recovery was not known, the records indicated the general location of recovery. It was therefore possible with reasonable confidence to assign each reported recovery to one of the areas whose boundaries and designations are indicated in Figure 1. Figure 1 shows no Area V because returns assigned to that area are returns which could have come from either Area IV or Area VI.

The dates and places of recovery of each tag are summarized in Table 2. In addition to the recoveries listed in Table 2, the following were also recorded: tag 102 recovered from a male July 15, 1940, in Playgreen Lake; tag 132 recovered from a male December, 1938 in Lake St. Martin; tag 288 recovered from a male October 20, 1940, in Playgreen Lake and tag 1688 recovered from a male July, 1940, locality unrecorded. Lake St. Martin is about thirty miles up the Dauphin River from the point of tagging while Playgreen Lake is almost continuous with Lake Winnipeg, down the Nelson River, which drains Lake Winnipeg from the northeast corner.

RELATIONSHIPS BETWEEN TIME OF RECOVERY,
PLACE OF RECOVERY, AND TIME OF TAGGING

Table 3 indicates the relationship between time and place of recovery, and Table 4 indicates the relationship between time of tagging and place of recovery. Several very interesting facts are at once apparent from a study of these tables.

1. The one individual listed as caught in Area I during the winter of 1939-40 was taken at spawning time in exactly the same place that it was released a year before. Similarly the one individual listed as caught in Area VI during the winter of 1940-41 was caught during the spawning season at approximately the same place that it was originally captured two years before.

These were the only individuals recaptured on their original spawning grounds. Since nets are set annually in these places to take spawning fish, there was obviously little tendency to return at spawning time to the exact place at which they were taken in spawning condition in 1938.

2. Except during the winter immediately following the tagging no tags were recovered by the winter fishery in the two areas nearest to the point at which tagged fish were released (one tag was recovered by the winter fishery in Area IV during the winter of 1940-41). Since the winter fishery begins soon after spawning ends, this indicates that the whitefish which were prepared to spawn at the Dauphin River in 1938, showed little tendency to return to that general vicinity at spawning time. One of the tags recovered at Playgreen Lake was on a whitefish which since the date of recapture was October 20, was apparently prepared to spawn near there, about 120 miles from where it was apparently prepared to spawn two years before.

3. The recoveries in the winter season immediately following tagging involved a disproportionate number of fish which were released during the later part of the season. This indicates that the longer fish were at large, the greater was the likelihood that they would leave the general area, or in some other way become less vulnerable to the fishery.

4. During the summer which immediately followed tagging, tags were recovered only from the two areas farthest from the point at which tagged fish were released (about 100 miles away). Although a few were recovered in subsequent years in the nearer of these two areas, none were taken in any other year in the farther area. These fish were predominantly ones that were tagged towards the end of the spawning season.

5. It was only during the second summer after tagging that tags were first returned from the areas nearest to the point at which the tagged fish were originally released. Tags from these areas were recovered also during the third, fourth, and fifth summers. They were predominantly from fish that had been tagged early in the spawning season.

6. Since the amount of fishing effort remained approximately constant from 1939 to 1943, then the number of tags recovered each year should have formed a geometric progression (diminishing) if the catchability (the term catchability as here used is defined by DeLury (DeLury 1947) as the proportion of the population captured during a certain time by one unit of fishing effort) remained constant. However, neither in the lake as a whole, nor in any particular part of the lake was there such a geometric progression. That is, the catchability of tagged fish did not remain constant.

7. The fish which were tagged first were most liable to recapture, those tagged next least liable, and those tagged last had an intermediate chance of being recaptured.

SEX AND ORIGINAL PLACE OF CAPTURE

Table 5 shows the relationship between sex, original place of capture, and area of recapture. Table 6 shows the proportion of fish recovered out of the total number tagged of each sex and from each place of capture.

There was no apparent tendency for disproportionate numbers of either sex to be taken in any particular area.

Fish which were originally captured at Dauphin River predominated in the returns from the more southern portion of the summer whitefish grounds while those taken originally at the Poplar River predominated in the returns from the more northern portion. This was necessarily the case where Dauphin River fish were predominantly the first tagged and Poplar River fish predominantly the last tagged and where the first fish tagged were predominantly those which were subsequently caught in the southern part of the fishing grounds, while the last tagged were predominantly those which were subsequently caught in the northern part of the fishing grounds. No particular significance is attached to the fact that the fish which were originally captured

at the more northerly point (Poplar River) were recaptured predominantly in the more northerly areas, since in the actual area nearest to this point of original capture (Area VI) equal numbers from each point of original capture were returned.

It is impossible to say whether the difference in the proportion of recoveries of males which originated at the two places is the result of a difference in mortality rate or of the apparent difference in behaviour which probably exposed them unequally to the possibility of capture. Any difference in mortality rate would have to be considerable to account for the facts since, in general, the Poplar River fish were exposed to diminution by mortality for a shorter time than the Dauphin River fish.

THE TENDENCY FOR CERTAIN INDIVIDUALS TO REMAIN TOGETHER

Table 7 shows all the cases where two or more tagged whitefish were recorded as recaptured the same day. Of these, group 4 were recorded as recovered at exactly the same place; groups 1, 2, 5, 6, 7, 10, 12, 14, 15 and 16 were recorded in such a way that although it is not certain that they were recaptured at exactly the same place, it is unlikely that they were recaptured at widely separated points; groups 3 and 9 were recorded as recaptured at places which were negligible distances

apart; and only groups 8, 11 and 13 were recorded as recaptured at places more than three miles apart.

Thus about one quarter of the tags were returned on the same day and from approximately the same place as other tags. This proportion is too great to be the result of coincidence. Obviously individual tagged fish tended to remain together for several years.

The fish which were recovered on the same date and at what was presumably practically the same place were predominantly tagged within a short time of one another. This indicates that the fish tended to leave the tagging area shortly after they were released, so that the shorter the time between the tagging of any two individuals, the greater would be the likelihood of those two individuals staying together.

In general, fish taken on a particular day and at what was presumably practically the same place were either all originally captured at the Dauphin River or all originally captured at the Poplar River, although there were exceptions to this rule. No significance is attached to this fact since the Dauphin River fish were predominantly tagged earlier in the season, while the Poplar River fish were predominantly tagged later in the season, and therefore this situation presumably arose because of the tendency shown in the last paragraph.

DISCUSSION

The following seems to be the most likely way in which the tagged fish behaved. There are other conceivable interpretations of the data.

The fish soon left the immediate vicinity of the place at which they were tagged, probably in schools. Most of the fish tagged earliest left soon enough that they were not available for capture by the commercial fishery which started a few days after tagging ended. Those tagged latest were present in the vicinity for longer so that more of them were taken by the fishery.

A group consisting mostly of these late-tagged fish went to the northern part of the whitefish grounds where they were available to the fishermen during the following summer. After that their catchability was slight, possibly because they migrated to some part of the lake which was not exploited, although this is not the only possibility,

A group consisting mostly of early-tagged fish were completely unavailable to the fishermen during the summer of the first year after tagging. They became available during the second summer and remained so until the end of the fifth summer, although the catchability was apparently not constant.

Apparently a third group which consisted predominantly of fish which were tagged in the middle of the spawning season

never became as vulnerable to the fishery as the other two groups except during the winter immediately following tagging. An alternative explanation of the facts on which this statement is based would be an unusually high mortality rate among the fish tagged at this time.

CONCLUSIONS

The following conclusions apply specifically to the whitefish tagged at the mouth of the Dauphin River in 1938, although they may have a more general application.

1. Catchability varied considerably from year to year. Catchability also probably varied with the time of tagging which apparently was related to the subsequent movements of the fish.

2. There was little tendency for fish to return at spawning time to the grounds on which they were apparently about to spawn in 1938.

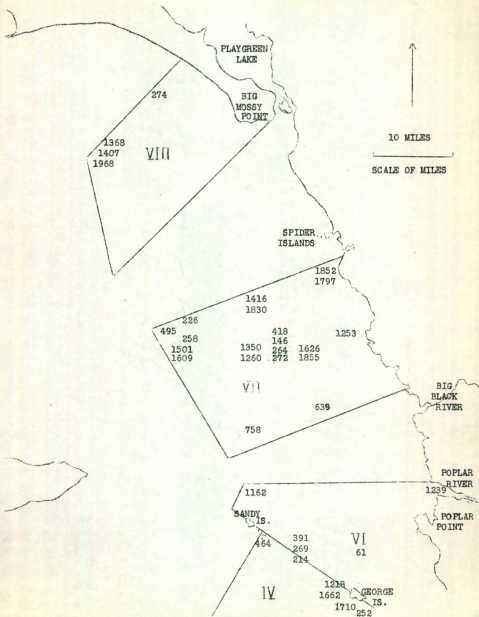
3. Certain individuals tended to remain together for several years.

Unless the tagged fish behaved in a fashion completely atypical of Lake Winnipeg whitefish in general then the corollary of Conclusion I is that: the catch does not necessarily indicate the abundance of whitefish in Lake Winnipeg.

BIBLIOGRAPHY

- DeLury, D. B. On the Estimation of Biological Populations.
Biometrics 1947, Vol. 3 No. 4, pp. 145-167.

Figure I. Sketch map of northern Lake Winnipeg showing areas of tag recovery. Figures represent places of recovery of specified tags.



13

1054
1607

529

IV

1652

163-103

251

1816
612
III

BEREN
R.

1049

I

1586

1545 STURGEON
914 BAY

441

809

1517

1282

1128

1535

348

DAUPHIN
RIVER

II

KIN-
WOW
BAY

LAKE
ST. MARTIN

10 MILES

SCALE OF MILES

Table I. A summary of the recorded information on 2,003 whitefish tagged and released alive by D. Hinks into Lake Winnipeg at the mouth of the Dauphin River during the 1938 spawning season.

Date of tagging	Fish Captured at the Dauphin River				Fish Captured at the Poplar River			
	Tags	No. of fish tagged and released alive			Tags	No. of fish tagged and released alive		
		Males	Fe- males	Total		Males	Fe- males	Total
Oct. 27	26-81	26	28	54	-	0	0	0
Oct. 28	82-87	3	3	6	-	0	0	0
Oct. 29	88-247	74	82	156	-	0	0	0
Oct. 30	248-373	124	0	124	-	0	0	0
Oct. 31	374-516	94	47	141	-	0	0	0
Nov. 1	-	0	0	0	517-557	21	19	40
Nov. 2	558-632	37	38	75	-	0	0	0
Nov. 4	633-671	17	22	39	672-796	102	21	123
Nov. 5	797-828	20	12	32	-	0	0	0
Nov. 6	829-852	14	10	24	853-1003	131	19	150
Nov. 7	1004-1030	9	17	26	-	0	0	0
Nov. 8	1031-1035	0	5	5	1036-1248	201	9	210
Nov. 9	1254-1261	2	6	8	1249-1253	2	3	5
Nov. 10	-	0	0	0	1262-1420	154	5	159
Nov. 11	1600-1608	6	3	9	1421-1599	168	11	179
Nov. 12	1863-1951	0	79	79	1609-1862	247	7	254
Nov. 14	-	0	0	0	1951-2060	105	0	105

Table II. A summary of the recorded information on the tags which were recovered from whitefish originally tagged and released alive into Lake Winnipeg at the mouth of the Dauphin River during the spawning season, 1938. In each column the data listed are tag numbers, sex (M for male, F for female), and date of recovery. The areas of recovery are defined in Figure I.

		Area of recovery			
		I	II	III	
156M	Dec. --, 1938	370M	Dec., 1939	251M	June 27, 1941
175M	Mar. 29, 1939	775M	Dec., 1938	612M	July 3, 1941
★ -	Dec. --, 1938	869M	Nov./Jan. 15/39	1049F	June 16, 1941
441F	Oct. --, 1939	933M	Dec., 1938	1816M	June 24, 1941
809M	Dec. --, 1939	976M	Dec., 1938	2018M	July --, 1940
840M	Feb. --, 1939	1120M	Dec., 1938		
914M	Feb. 9, 1939	1333M	Dec., 1938		
1123M	Dec. 31, 1938	1724M	Dec., 1938		
1128M	Dec. --, 1938	2012M	Dec., 1938		
1282M	Dec. 12, 1938				
1517M	Dec. 12, 1938				
1535M	Dec. --, 1938				
1545M	Dec. 12, 1938				
1586M	Feb. 2, 1939				
1903F	Dec. 1, 1938				
1969M	Dec. --, 1938				
1982M	Dec. 26, 1938				

★ A tag recorded as 348 was reported for this date and place but no fish was recorded tagged with number 348.

Table II. (Cont'd.)

Area of recovery		
IV	V	VI
85M June 25, 1940	73M July 11, 1941	61M July 4, 1940
103F July 6, 1943	199M July 2, 1940	94M July 19, ----
114F July 10, 1941	221F ---- --, 1941	186M June 22, 1940
140F July 15, 1941	242F Aug. 5, 1943	214M July 19, 1940
163F July 16, 1942	262M June 25, 1940	269M Aug. 7, 1943
194M July 20, 1940	280M June 26, 1942	391F Aug. 7, 1943
220M July 10, 1941	301M June 18, 1940	1162M July 22, 1941
250M June 12, 1940	446F July 12, 1941	1239M Oct. 10, 1940
252M July 9, 1941	512M July 11, 1941	1476F June 25, 1940
297M June 26, 1940	573F July, --, 1941	1702M June --, 1941
308M July 1, 1941	1311M July 20, 1940	2007M June 28, 1940
464M June 29, 1943	1758M July 6, 1940	2016M June 26, 1940
492M July 11, 1940	1853M July 17, 1943	
529F July 18, 1940		
750F July 6, 1940		
792M June 26, 1940		
972M June 20, 1940		
1054M July 16, 1940		
1187M June 29, 1940		
1218M June 26, 1941		
1607M July 16, 1940		
1652M Jan. 18, 1941		
1662M July 16, 1940		
1705M June 11, 1941		
1710M July 18, 1940		

Table II. (Cont'd.)

Area of recovery	
VII	VIII
146M June 26, 1941	274M Aug. --, 1939
226M Aug. 3, 1939	1368M July 1, 1939
258M Aug. 9, 1939	1407M July --, 1939
264M June 21, 1941	1410M July --, 1939
272M July --, 1939	1968M July 25, 1939
300M July --, 1939	
430M July 6, 1939	
495F Aug. 3, 1939	
639F July 31, 1943	
758F July --, 1942	
784M July --, 1939	
957M ---- --, ----	
1118M June 11, 1942	
1253M June 18, 1942	
1260F Aug. 1, 1939	
1296M July --, 1939	
1319M ---- --, ----	
1350M July --, 1939	
1416M Aug. 4, 1939	
1501M July --, 1939	
1609M July 15, 1940	
1614M July --, 1939	
1626M July --, 1939	
1632M July 17, 1940	
1639M July 17, 1940	
1693M July 6, 1939	
1698M July --, 1939	
1778M July --, 1939	
1797M July 6, 1939	
1811M ---- --, ----	
1830M Aug. 4, 1939	
1852M July 4, 1939	
1855M July 12, 1939	
1857M ---- --, ----	
1995M July 7, 1940	

Table III. The number of tagged whitefish reported as recaptured from each area (see Figure I for definitions of area) during each season.

Season recaptured	Area of recapture								Total
	I	II	III	IV	V	VI	VII	VIII	
Winter 1938-39	16	9	0	0	0	0	0	0	25
Summer 1939	0	0	0	0	0	0	21	5	26
Winter 1939-40	1	0	0	0	0	0	0	0	1
Summer 1940	0	0	1	14	5	7	4	0	31
Winter 1940-41	0	0	0	1	0	1	0	0	2
Summer 1941	0	0	4	7	5	2	2	0	20
Winter 1941-42	0	0	0	0	0	0	0	0	0
Summer 1942	0	0	0	1	1	0	3	0	5
Winter 1942-43	0	0	0	0	0	0	0	0	0
Summer 1943	0	0	0	2	2	2	1	0	7

Table IV. The number of tagged whitefish reported as recaptured from each area (see Figure I for definitions of area) which were tagged during each third of the season.

Period during which tagged	Area of recapture								Total	Percentage of Total No. tagged
	I	II	III	IV	V	VI	VII	VIII		
Oct. 27- Nov. 1	4	1	1	14	9	6	8	1	44	8.4
Nov. 2- Nov. 8	5	5	2	6	1	2	6	0	27	3.9
Nov. 9- Nov. 14	8	3	2	5	3	4	21	4	50	6.3
Total	17	9	5	25	13	12	35	5	121	6.0

Table V. The number of tagged whitefish recaptured in each area (see Figure I for definition) classified by sex and place at which they were captured prior to tagging.

	Area of recapture								Total
	I	II	III	IV	V	VI	VII	VIII	
Dauphin R. males	4	1	2	10	6	5	8	1	37
Dauphin R. females	2	0	1	4	4	1	3	0	15
Poplar R. males	10	8	2	9	3	5	23	4	64
Poplar R. females	0	0	0	2	0	1	1	0	4
Total Dauphin R.	6	1	3	14	10	6	11	1	52
Total Poplar R.	10	8	2	11	3	6	24	4	68
Total males	14	9	4	19	9	10	31	5	101
Total females	2	0	1	6	4	2	4	0	19

Table VI. The proportion of fish recovered out of the total number tagged of each sex from each place of capture. The proportions are expressed in percentages in each case.

Place at which fish were captured prior to tagging	S e x		Total
	Males	Females	
Dauphin R.	9.4	4.2	7.0
Poplar R.	5.7	4.3	5.6
Total	6.7	4.2	6.2

Table VII. A summary of all the cases where two or more tags were recorded as recovered on the same day. The descriptions under place of recapture are exactly as given in the original records.

Group No.	Date of Recapture	Tag No.	Place of Recapture	Day tagged in 1938	Origin before tagging
1	Dec. 12/38	1282	Near Dauphin River	Nov. 10	Poplar River
		1517	Near Dauphin River	Nov. 11	Poplar River
		1545	Dauphin River	Nov. 11	Poplar River
2	July 6/39	430	Black River	Oct. 31	Dauphin River
		1693	Black River	Nov. 12	Poplar River
		1797	14 mi. S. Spider Is.	Nov. 12	Poplar River
3	Aug. 3/39	226	17 mi. S.W. Spider Is.	Oct. 29	Dauphin River
		495	20 mi. S.W. Spider Is.	Oct. 31	Dauphin River
4	Aug. 4/39	1416	12 mi. S.W. Spider Is.	Nov. 10	Poplar River
		1830	12 mi. S.W. Spider Is.	Nov. 12	Poplar River
5	June 25/40	85	S.E. Big George Is.	Oct. 28	Dauphin River
		262	Big George Is.	Oct. 30	Dauphin River
		1476	Poplar Pt.	Nov. 11	Poplar River
6	June 26/40	297	S.E. Little George Is.	Oct. 30	Dauphin River
		792	S.E. Little George Is.	Nov. 5	Poplar River.
7	July 6/40	750	S.E. Big George Is.	Nov. 4	Poplar River
		1758	Little George Is.	Nov. 12	Poplar River
8	July 15/40	102	Playgreen Lake	Oct. 29	Poplar River
		1609	20 mi. S.W. Spider Is.	Nov. 12	Poplar River
9	July 16/40	1054	2½ mi. S. Big George Is.	Nov. 8	Poplar River
		1607	2 mi. S. Big George Is.	Nov. 11	Dauphin River
		1662	2 mi. W. Big George Is.	Nov. 12	Poplar River
10	July 17/40	1632	Black River	Nov. 12	Poplar River
		1639	Black River	Nov. 12	Poplar River
11	July 18/40	529	10 mi. S.E. Big George Is.	Nov. 1	Poplar River
		1710	½ mi. W. Big George Is.	Nov. 12	Poplar River
12	July 20/40	194	S.W. Big George Is.	Oct. 29	Dauphin River
		1311	Cannibal Is.	Nov. 10	Poplar River
13	June 26/41	146	12 mi. N.W. outer buoy at Big Black River	Oct. 29	Dauphin River
		1218	2½ mi. S.W. Little Geo. Is.	Nov. 8	Poplar River
14	July 10/41	114	S.W. Little George Is.	Oct. 29	Dauphin River
		220	S. of Sandy Is.	Oct. 29	Dauphin River
15	July 11/41	73	Big George Is.	Oct. 27	Dauphin River
		512	Big George Is.	Oct. 31	Dauphin River
16	Aug. 7/43	269	3 mi. E. Cannibal Is.	Oct. 30	Dauphin River
		391	24 mi. S.W. Big Black River	Oct. 31	Dauphin River

