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Studies on Fish Migrations in Portage Creek, an Inlet to
Big Portage Lake in Jackson County,
by use of a Two-way Fish Trap
by Stanley J. Lievens

A two-way fish trap was operated during the spring of 1946 in Portage Creek (T2S, R2E, Sec. 6, 8), the inlet to Big Portage Lake (T1 and 2S, R1 and 2E, Sec. 30, 31, 25, 36, and 6) in Jackson County. On Portage Creek, about 1/4 mile above the lake, is an artificial pond (Portage Creek Pond) which is being managed to provide trout fishing. Trout plantings in this pond have been as follows: 350 each of brook, brown and rainbow trout in the fall of 1942 and 1943, and 450 each of browns and rainbows in the fall of 1944 and 1945. The trout were fin-clipped for future identification. Returns of brook trout to the anglers have been poor, and direct observations during the spring of 1945 by G. N. Washburn indicated that many of the trout (especially brooks) which were planted in the pond were passing over the dam and down Portage Creek toward the lake. The chief purpose of the installation of the fish trap in Portage Creek in 1946 was to check on the amount of trout escapement downstream from the pond, and to see if any previously escaped trout would return to Portage Creek from the lake below. Incidental to this primary purpose of the trap was a study of the migration of other species from Big Portage Lake into the creek.

The one-fourth mile stretch of Portage Creek, between the lake and the trout pond, is a spring-fed, moderately swift-flowing, brush-meadow type. Its summer flow is approximately 2 c.f.s. The bottom is chiefly marl and pulpy peat with a thin overlying layer of sand, and with occasional stretches of rubble and gravel. The stream is approximately 9 feet wide and 1-1/2 feet deep in the lower section where the weir was installed, and about 4 feet wide by 1 to 3 feet deep in the upper section below the pond.

The two-way trap was designed and built by Institute personnel. It is a portable, box-frame type, with movable wings (Figure 1) designed for its flexibility to conform to various types of streams. It has two removable, pyramidal cones and a dividing screen which facilitate cleaning. The cones are made of 1/2-inch galvanized wire, have a 4-3/4- by 5-1/2-inch opening, and are built with the bottom side slightly inclined. The dividing screen is rectangular in shape, of galvanized wire screen, and with a wood frame. The floor is built of wood, and the top consists of two large wooden swinging doors, one for each half of the trap. The wire mesh wings, 8 feet by 4-3/4 feet, can be attached to the trap corners at almost any angle. The trap and the wings were anchored to the stream bed by the use of fence posts and lag screws. Undercutting was prevented by sinking a row of sheet piling in front and in back of the wings and in front of the trap entrances.

The weir was installed in Portage Creek approximately 150 yards above Big Portage Lake. It was installed on March 15 and checked for the first time the following morning. Daily checks were made between 8 and 9 A.M., except on May 16 and 17 when the weir was disrupted by

high water and on two other days when other work detained the checker. Fish were removed with a soap and released in the direction they were going. The catches were recorded in numbers, size ranges in total lengths, and sex when determinations were possible by external characters. The number of fish taken and the averaged air and stream water temperatures are recorded in Table 1. The water temperatures were taken at the time of checking the trap; the air temperatures are mid-day readings. The trap was removed on June 17, after the spring migration of most species was over.

The species of fish taken in the trap were as follows: Rainbow trout (Salmo gairdnerii irideus), common sucker (Catostomus c. commersonii), chub sucker (Erimyzon sucetta kernerlii), carp (Cyprinus carpio), horny-head chub (Nocomis biguttatus), creek chub (Semotilus a. atromaculatus), golden shiner (Notemigonus crysoleucas auratus), spottail shiner (Notropis h. hudsonius), yellow bullhead (Ameiurus n. natalis), black bullhead (Ameiurus m. melas), mudminnow (Umbra limi), mud pickerel (Esox vermiculatus), yellow perch (Perca flavescens), largemouth bass (Huro salmoides), longear sunfish (Lepomis megalotis peltastes), pumpkinseed (Lepomis gibbosus), bluegill (Lepomis m. macrochirus), rock bass (Ambloplites r. rupestris), and black crappie (Pomoxis nigro-maculatus).

To summarize generally, the records (for March 16 to June 17) indicate a negligible movement of escaped trout in the stream, a wandering of centrarchids and bullheads, and apparent spawning migrations of the common sucker, chub sucker, mud pickerel, spottail shiner, creek chub and golden shiner.

Three marked rainbow trout were checked coming downstream and one was captured moving upstream. All four rainbows were marked fish, part

of the 1945 fall planting. They were returned to Portage Creek Pond immediately upon capture. The one upstream migrant apparently had escaped from the pond and descended to Big Portage Lake before the trap was installed on March 15.

Bluegills and pumpkinseeds were taken during every week of the weir's operation (March 15 to June 17). A very definite rise in numbers of bluegills occurred during late May and early June. Most of the bluegills were from 2 to 4-1/2 inches in length, with a few reaching 6 to 7 inches. The small size of the bluegills and sunfish and the type of habitat found in the creek suggest that their migration was not for the purpose of spawning. Forty largemouth bass ascended the stream from the lake. These fish were from 3 to 13 inches long with the greatest number at approximately 9 inches. The bass started coming upstream as the water temperatures reached 50° F. (April 21) and continued coming up occasionally for the duration of operation of the weir. As indicated in the summary table, great numbers of the upstream centrarchids failed to return prior to June 17. The greatest downstream movement of the more numerous centrarchid species was encountered during the last few weeks of operation, and this suggests many returned to the lake after the trap was removed. Many bluegills and sunfish were observed in several of the larger pools of the creek throughout the summer.

The majority of the black and yellow bullheads were taken during the first two weeks (last half of March), and it is probable that there was a considerable run of bullheads before the trap was installed. The size range was 2 - 10 inches for the yellow bullheads, and 3 - 7 inches for the black bullheads. There was no dominant size for either species.

Judging from the lack of still water in the stream and from the early dates, it is believed that the run of bullheads was not for spawning purposes.

There was a definite spawning run of common suckers. Of 113 suckers checked coming from the lake, 97 were mature. Sex determinations were made on 67 fish from which eggs or milt flowed freely while the fish were handled; 42 of these were females and 25 were males. The water temperatures during the heaviest runs were between 52 and 55° F., and these runs occurred during the period from the middle of April to the first week in May. Only 14 suckers were checked returning downstream. All of those returning were badly bruised and fungused. Three additional fish were found dead only a short distance upstream from the trap. Judging from the fact that all returning suckers were badly bruised it seems probable that this happened to most of the suckers in the run. The question of the fate of the suckers which did not come downstream remains unanswered. Some of them may have been destroyed by predators or taken by fishermen, and it is possible (but unlikely) that many of them remained in the deeper pools in the creek until after the trap was removed.

The probable spawning migration of the chub sucker and mud pickerel was on apparently at the time the weir was being installed. Chub suckers were caught occasionally until mid-June, whereas the last mud pickerel was taken May 14. The water temperatures recorded during the heaviest runs of both species were between 45 and 50° F. Insufficient data were collected on the sex ratio of the chub suckers, and no data on the mud pike, although some females were observed swollen with eggs and in the case of the chub suckers, several males were noted with breeding tubercles. The chub suckers were 4 to 8 inches in length. The mud pickerel were

4 to 11 inches with 8-1/2 inches as the dominant size. The greatest number of mud pickerel returned to the lake soon after their apparent spawning was over. Stragglers continued coming downstream throughout the duration of the weir's operation. A few pike were seen during the mid-summer months near the dam indicating some did stay in the stream. Relatively few chub suckers returned downstream; the reasons for the low return are not known.

Great Lakes spottail shiners came in large schools commencing on April 19. Only estimations on the numbers of shiners could be made because the trap retained only the larger individuals while all the small ones passed through the wire mesh. A check was made on the sex of one-hundred of the larger fish taken from the trap by observing the abdomens; forty-eight were females and fifty-two were males. The females were bulging with eggs, many of which were oozing out, and the thin fish were assumed to be the males. Ripe females were taken from late April until late May, indicating the spawning period was approximately of one months duration. The close agreement between estimated numbers of upstream and downstream migrants suggests that there was a complete return of these fish to the lake.

The run of creek chubs was light. It is possible that their upstream movement may have started before the weir was established. Twenty of the thirty chubs taken were identified as to sex by the presence of nuptial tubercles and the darker coloration of the males, as follows: Seven were males, and thirteen females. Those identified as females were 3 to 7 inches long as compared with 6 to 8 inches for the males. The recorded peak of the run occurred from late March to the middle of April. The water temperatures for the days of the heaviest

runs were between 44 and 54° F. Creek chubs were seined for other purposes from the portion of Portage Creek upstream from the trap during the period when chubs were recorded moving upstream. This destroyed all value of the downstream tabulation, as it is not known what percentage of the seined chubs were migrants or natives of the stream. Many of the chubs undoubtedly were permanent residents of the creek, as more chubs were seined than had moved upstream through the weir.

An estimated 50 golden shiners were taken by the trap, moving upstream, on April 21. The water temperature was 48° F. These shiners were ripe. They ranged in length from about 3 to 7-3/4 inches. Very few returned downstream, for which no explanation can be given.

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Figure 1.--Portable two-way fish trap operated in Big Portage Lake inlet.

When installed, undercutting was prevented by sinking sheet piling under wings and trap entrances.

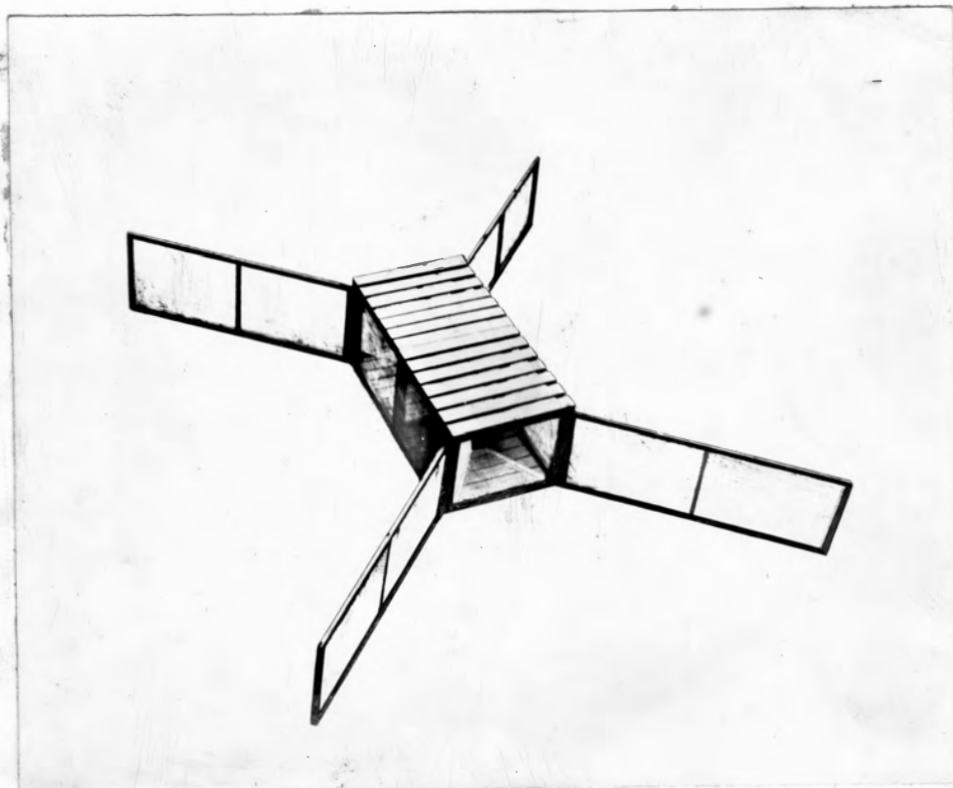


Table 1.--Upstream and downstream movement of fish in trap on Portage Creek
Summarized by week, March 16 to June 17.

Date	March		April				May					June		Totals
	16-23	24-31	1-8	9-15	16-22	23-30	1-7	8-15	16-17	18,20-24	25-31	1-4,6-9	10-13,15-17	
Average air temperature	55.6	64.7	54.8	51.6	60.0	59.7	59.0	62.1	...	62.1	68.6	66.6	78.0	...
Average water temperature	46.6	50.6	46.5	46.3	50.9	60.9	54.1	54.5	...	59.5	62.8	62.0	68.4	...
Species	Upstream Migrants													
Rainbow trout	1	...	...	...	...	...	...	...	...	...	...	...	...	1
Common sucker	3	10	7	...	13	38	29	3	...	6	1	2	1	113
Chubsucker	66	28	4	...	4	3	2	...	...	9	2	...	2	120
Carp	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Hornyhead chub	...	...	...	...	...	...	...	...	...	4	2	...	...	6
Creek chub	1	5	7	6	3	...	2	...	...	4	...	2	...	30
Golden shiner	1	...	1	...	(51)	...	1	...	...	...	...	...	...	(54)
Common shiner	1	...	...	...	2	...	...	1	...	4	...	4	2	14
Spottail shiner	...	...	...	...	(546)	...	(116)	(79)	...	(7)	...	...	...	(748)
Yellow bullhead	80	168	6	...	9	22	2	...	...	5	1	6	...	299
Black bullhead	...	109	7	1	7	45	7	...	...	4	4	8	1	193
Mudminnow	...	1	...	...	...	...	...	...	WEIR OPEN	...	...	...	...	1
Mud pickerel	28	6	5	2	...	2	...	6	...	...	...	...	...	49
Yellow perch	3	...	1	...	...	...	...	...	...	...	...	1	4	9
Largemouth bass	1	...	...	...	1	5	3	1	...	5	13	6	5	40
Longear sunfish	...	...	...	...	...	1	1	1	...	1	6	...	1	11
Pumpkinseed	137	95	19	3	13	34	9	4	...	107	104	55	74	654
Bluegill	...	28	21	9	21	64	50	135	...	429	349	378	302	1,786
Rock bass	...	4	...	...	...	11	5	8	...	13	7	5	9	62
Black crappie	...	...	...	...	...	...	...	...	...	1	...	6	2	9
	Downstream Migrants													
Rainbow	1	...	...	...	...	...	1	...	...	1	...	...	...	3
Common sucker	...	...	...	...	...	2	2	4	...	2	2	...	...	12
Chubsucker	3	...	...	...	1	4	8	2	...	6	3	1	...	28
Carp	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Hornyhead chub	...	...	...	...	...	...	...	...	...	1	3	2	1	7
Creek chub	1	...	...	...	1	1	2	3	...	2	...	...	...	10
Golden shiner	...	...	2	...	...	...	1	...	...	...	...	...	...	3
Common shiner	...	...	2	...	1	...	...	...	...	...	1	...	...	4
Spottail shiner	...	...	...	...	(50)	(326)	(110)	(119)	...	(31)	1	...	...	(637)
Yellow bullhead	2	3	6	...	...	4	25	5	...	4	...	2	1	52
Black bullhead	...	1	...	...	...	4	9	3	...	3	...	...	2	22
Mudminnow	2	...	...	...	...	...	...	...	...	...	...	...	...	2
Mud pickerel	20	4	4	...	1	1	1	...	...	1	1	1	...	34
Yellow perch	...	...	...	...	...	...	...	...	...	4	...	...	1	5
Largemouth bass	...	...	...	...	...	...	...	...	...	4	1	2	1	8
Longear sunfish	...	...	...	...	...	...	1	...	...	3	1	1	...	6
Pumpkinseed	11	26	8	1	6	6	10	5	...	33	17	34	6	163
Bluegill	2	1	2	2	2	5	7	29	...	111	49	88	102	400
Rock bass	...	...	1	...	1	...	3	...	...	1	3	9	5	23
Black crappie	...	...	...	...	...	...	...	...	...	...	...	3	...	3

↓ All figures in parentheses are estimated numbers.