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ACTIVITIES AND INVESTIGATIONS AT GUILEY POND, IOSCO COUNTY, DURING 1944, WITH A SUMMARIZATION OF THE FOOD OF THE GUILEY POND TROUT DURING 1942

by

Pat Galvin and David S. Shetter

Since 1940 Mr. Eddie Parker, the owner of Guiley Pond, and The Sportsmen's Improvement Association, at the suggestion of the Institute, have carried on intensive creel census on this artificial pond of 1.75 acres. (For further information pertaining to the construction, operation, and early history of this project, see Institute reports number 639, 734, and 950.) Through the cooperative efforts of Mr. Parker, the anglers, and the Institute for Fisheries Research, data are being collected so this pond may be managed in a way that may afford the angler the best fishing. The data collected here may also be of value in the management of similar bodies of water elsewhere in the state.

In brief, Mr. Parker, under permit from the Conservation Department, has confined a number of the large rainbow trout migrating up the East Branch of the Au Gres River and thence into Guiley Creek in a man-made pond located about 1/2 mile upstream from the junction of the Guiley and Au Gres River. This gives the angler an opportunity to fish for large trout over an entire season rather than for only a short time early in the season when these fish are upstream to spawn.

Evidence that many anglers enjoy this type of sport is apparent upon reviewing the angling effort expended over this small water area during past seasons. In spite of rather stringent "pond regulations," such as fishing with flies only, 8 inch limit, and lower catch limits than the law permits, many anglers have visited "Parker's Puddle" in the past few years. A summary of the 1944 activities follows.

Enlargement of Pond

Guiley Pond was enlarged during the late winter and early spring of 1944 with the aid of a dragline and scoop shovel. Accumulations of silt and debris were removed, and much of the pond was deepened. The expenses for this operation were borne by The Sportsmen's Improvement Association, and resulted in the addition of one-half acre of water surface. The pond now has an area of 1.75 acres, as determined from a map prepared during May, 1944, by O. M. Corbett of the Institute for Fisheries Research.

Summary of Spawning Run and Tagging Activities in 1944

The weir below Guiley Pond was kept in operation through the rainbow trout spawning season again in 1944. Daily air and water temperatures were recorded for each day during the year. The number of mature and immature trout moving was recorded also. Weights of both the mature and immature fish were taken and the sex was determined when possible. Most fish over the legal limit of seven inches were jaw-tagged and all smaller rainbows were marked by clipping the dorsal fin with manicure shears. All fish handled were put into Guiley Pond but due to the 1 1/2 inch space between slats at the dam spillway, fish up to 12 inches can pass either up or down stream as they choose. All fish put into the pond did not stay there as evidenced by recoveries of marked trout downstream. The above data, collected daily, have been summarized by weekly periods and are submitted in Table 1 for the

Table 1

GUILEY POND WEIR RECORD SUMMARY

March 18-June 17, 1944

Weekly period 1944	Average weekly temperature			Mature males trapped			Mature females trapped			Immature fish trapped			Total weight all fish (oz.)
	Max. air	Min. air	Water	Number	Total weight (oz.)	Average weight (oz.)	Number	Total weight (oz.)	Average weight (oz.)	Number	Total weight (oz.)	Average weight (oz.)	
Mar. 18-25	32.9	16.7	34.2	2	50	25	1	46	46	245	322.00	1.31	418.00
Mar. 26-Apr. 1	37.3	21.9	34.9	17	876	51.5	5	496	99.2	116	122.75	1.05	1,494.75
Apr. 2-8	39.0	17.7	35.5	19	857	45.1	6	454	75.6	124	167.50	1.35	1,478.50
Apr. 9-15	40.5	24.4	37.0	31 [1]	1,650	53.2	20	1,801	90.0	19	10.75	0.56	3,461.75
Apr. 16-22	46.8	25.3	39.2	18	860.5	47.8	20	1,512	75.6	87	104.25	1.20	2,476.75
Apr. 23-29	51.2	34.5	43.1	8	429	53.6	9	839	93.2	17	9.50	0.56	1,277.50 [1]
Apr. 30-May 6	52.4	40.7	44.7	10	700	70.0	8	699	87.4	5	3.00	0.60	1,402.00
May 7-13	61.2	39.7	45.4	3	196	65.3	1	95.0	95.0	25	22.50	0.90	313.50
May 14-20	66.0	40.7	46.5	10	718	71.8	5	494	98.8	16	14.75	0.92	1,226.75
May 21-27	76.5	52.5	53.2	..	..	..	..	..	..	..	..	..	..
May 28-June 3	83.0	52.7	58.2	3	123	41.0	..	..	..	..	..	..	123.00
June 4-10	74.1	54.4	55.5	..	..	..	..	..	..	..	..	..	..
June 11-17	88.5	55.5	56.7	..	..	..	..	..	..	3	1.00	0.33	1.00
Totals	..	..	..	121	6,459.5	53.38	75	6,436	85.81	657	778.00	1.18	13,673.50

[1] 2 fish died - total weight 1,572 ounces, excluding the 2 dead fish.

time during which the spawning run lasted (March 18 to June 17, 1944). No fish were trapped at any other time.

Rainbow trout were first encountered in the weir on March 24 when Parker took 245 immature and 3 mature fish. The average water temperature for that week was 34.2°F. The water had been warmer than this for several weekly periods earlier in the year, but was not accompanied by any upstream movement of trout. Mature fish continued to move upstream through May 31 and immature fish through June 17.

The peak run of adult fish came during the week of April 9-15 when 51 rainbow trout were placed in the pond. The initial run (245) of immature fish was the largest weekly migration.

A total of 121 breeding males and 75 breeding females made up the 1944 run of mature fish. The male rainbows placed in the pond weighed 403.9 pounds, or were of an average weight of 3.33 pounds each; the females 402.2 pounds or an average of 5.36 pounds per fish. The total weight of mature fish put in the pond was 806.1 pounds.

The sex ratio of males to females was 1.61 to 1. The peak run of male fish came during the week of April 9-15. The peak run of females somewhat paralleled the run of male fish but lasted one week longer. The same number of mature females (20) moved the week of April 9-15 as the week of April 16-22.

A total of 657 immature fish also moved upstream to the dam at Guiley Pond. Their total weight was 48.6 pounds or an average fish of 1.18 ounces. The majority of immature rainbow trout (485 out of 657) moving upstream in 1944 arrived at the dam prior to the peak of the run of adult fish. Perhaps the "urge to move upstream" is equally as strong in immature fish as it is in adults and perhaps is felt at approximately the same time. However, the difference in the distance the mature and immature fish have to move to reach Guiley Pond and the time involved

in traversing this distance may explain the difference in time of arrival. Mature fish likely reside either in Lake Huron or the lower section of the Au Gres River, while immature rainbows are probably year-around inhabitants of the whole river system.

All immature fish handled at the Guiley before April 23, except fish taken the week of April 9-15, were apparently larger than those fish encountered after that date. The average weight by weekly periods of the early arrivals ranged from 1.05 to 1.35 ounces. Immature fish weighed by Parker after the 23d were considerably smaller, the average weight by weekly periods never exceeding 0.92 ounces, and the last three fish weighed (June 11-June 17) totaled one ounce, or 0.33 ounces per fish.

Creel Census

A total of 497 different anglers (307 male, 17 female, and 173[1] unknown fishermen) visited the pond on 996 occasions in 1944 (Table 2). Many anglers visited the pond several times during the season, which accounts for more angling days than anglers. About 80 per cent of the time (796 of the 996 angling days recorded) anglers left the pond without having soiled their creels. Expressing it in terms of successful anglers, less than one out of every four took one or more legal trout (8 inches or larger). These anglers spent 2,176.25 hours casting flies over this small expanse of water. This represents a pressure (angling hours spent per acre of surface area) of 1,243.5 hours per acre. In comparison with many trout streams this is far and above the angling pressure on any of our better trout waters. The average angling pressure over a six-year period on 4.33 acres of Hunt Creek, a brook trout stream lying about 65 miles northwest of the Guiley, is only 224 man-hours per acre. All of this emphasizes the angler's desire to catch one large trout rather than several smaller fish.

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[1] One hundred thirty of these were anglers that it was physically impossible to contact during the opening two days of the season, and who took no fish.

Table 2

SUMMARY OF THE ANGLING RESULTS ON GUILEY POND

DURING THE 1944 TROUT FISHING SEASON

(Percentage of unsuccessful anglers is given in parentheses)

Period	Number of anglers	Number taking no fish	Total hours angling	Legal trout caught			Catch per hour			Total weight (oz.)			Average weight		Lbs./hour of legal trout	Average length	
				Brook	Rainbow	Total	Brook	Rainbow	Total	Brook	Rainbow	Total	Brook (oz.)	Rainbow (oz.)		Brook mm.	Rainbow mm.
April 29-May 12[V]	261	226 (86.59)	601.50	29	37	66	0.05	0.06	0.11	114.50[++]	1,285.75	1,400.25[xxx]	4.77	34.75	0.146	232.0	413.70
May 13-May 26	144	117 (81.25)	352.00	13	22	55	0.04	0.06	0.10	76.75	1,049.50	1,126.25[xxx]	5.90	47.70	0.200	241.90	500.30
May 27-June 9	141	104 (73.75)	326.00	27	33	60	0.08	0.10	0.18	158.00	1,720.75	1,878.75	5.85	52.14	0.360	241.80	511.80
June 10-June 23	115	92 (80.00)	231.25	30	12	42	0.13	0.05	0.18	125.50	647.75	773.25	4.18	53.98	0.209	222.6	525.50
June 24-July 7	115	85 (73.91)	260.00	53	10	63	0.20	0.04	0.24	196.00	459.00	655.00	3.70	45.90	0.158	217.00	484.70
July 8-July 21	45	35 (77.77)	73.50	10	5	15	0.14	0.07	0.21	35.75	215.00	250.75	3.58	43.00	0.213	216.00	454.20
July 22-Aug. 4	52	44 (84.62)	88.50	7	4	11	0.08	0.05	0.13	23.50	165.75	189.25	3.36	41.43	0.214	212.90	451.00
Aug. 5-Aug. 18	44	34 (77.27)	86.00	20	6	26	0.23	0.07	0.30	67.25	175.25	242.50	3.34	29.20	0.176	210.10	383.30
Aug. 19-Sept 4	79	59 (74.68)	157.50	26	9	35	0.17	0.06	0.23	100.25	88.00	188.25	3.85	9.78	0.075	220.00	252.70
Totals	996	796 (79.91)	2,176.25	215	138	353	0.10	0.06	0.16	897.50	5,806.75	6,704.25	4.17	42.08	0.193	218.60	456.60

[V] During this period it was physically impossible for Parker to contact all anglers. He did contact all those who caught fish and estimated that there were 130 other anglers who fished an average of 2 hours each whom he did not contact. The above estimated number of anglers and hours are also included in the totals for that period.

[++] Total length and weight of (24) fish

[xxx] Total length and weight of (61) fish

[xxxx] Weight of one brook trout, 198 mm. (sublegal) included

The average angling day was of 2.18 hours duration, nearly 2 hours 11 minutes. The average catch per angling day was 0.353 legal trout, or a catch of 0.16 trout per hour. This seems like very poor angling as far as number of trout removed per unit of effort. The real measure, however, of the angling quality on this small pond is the pounds rather than the number of trout caught per hour.

In 1944, 353 legal trout--215 brooks and 138 rainbows-- were removed. The brook trout taken weighed slightly more than 56 pounds, the rainbows nearly 363 pounds, or a combined weight of a little more than 419 pounds. The rate of removal of these fish was 0.193 pounds per hour, which would be equivalent to catching one 3.08 ounce fish each hour (about an 8.5 inch fish).

The angling quality by two-week periods varied from 0.075 to 0.360 pounds of trout per hour. During the two-week period when angling was best (May 27-June 9) anglers caught 5.75 ounces of fish per hour. During that period the average brook trout taken weighed 5.85 ounces, the rainbows 3 pounds 2 ounces. For both species the average weight listed above for a comparable period of time was exceeded only once, and the combined total weight was the largest recorded by two-week periods for the entire season. During these 14 angling days anglers caught 9 pounds 14 ounces of brook trout and about 107 pounds 8 1/2 ounces of rainbow trout, a combined total of 117 pounds 6 1/2 ounces. The total weight of brook trout removed during this period was exceeded only one other time during the season, and the catch of rainbows in terms of pounds was the largest recorded that season.

For at least 10 of the slightly better than 18-week season, anglers caught at least 0.2 pounds or 3.2 ounces of trout per hour. During two other two-week periods (4 weeks in all) the quality was better than 0.150 pounds per hour and during one other period it was very near this

figure (0.146). Only during the last 17 days of the season, when anglers caught only 0.075 pounds per hour, was the angling quality really poor.

The average size of trout taken in 1944 was as follows: brook trout 8.6 inches and 4.17 ounces, rainbow trout 18 inches and 2 pounds 10 ounces.

The largest rainbow trout were taken from June 10-June 23. Rainbow trout removed during this period were of an average size of 20.7 inches and 3 pounds 6 ounces. The average size by two-week periods of rainbow trout caught prior to this time was progressively larger, and after this 14-day interval the average size dropped in the same step-like fashion.

Larger brook trout were taken during the second two-week period of the 1944 season than were taken at any other time during that season. Their average length was 9.5 inches, their weight 5.9 ounces. In fact the average size of brook trout taken from the opening through June 23d was larger than the brook trout caught during the remainder of the season.

Recovery of Marked Rainbow Trout During the 1944 Season

All marked trout recovered in 1944 were identified by the absence of either the dorsal or adipose fins or a tag in the jaw. All trout less than 6.5 inches long moving into the weir in 1941 were marked by the removal of the adipose fin. A total of 352 immature brook trout, 299 rainbow trout, and 5 brown trout fingerlings were so marked. None of the brook trout or brown trout were recovered in 1944, but 2 adipose marked rainbow trout were taken by anglers that year. When recovered in 1944, approximately three years after release, these fish averaged 19.7 inches and 2 pounds 13 1/2 ounces, considerable gain from 4 to 6 1/2 inches and 1/2 ounce at marking. In this time these fish had undoubtedly visited "greener pastures" in Lake Huron but had returned to the pond in 1944.

Fin clipping operations were discontinued in 1942 and 1943 and resumed in 1944. All rainbow trout fingerlings 3 1/2 to 6 7/8 inches

put in the pond in 1944 were marked by the removal of the dorsal fin. This operation went into effect March 25, 1944. From that date through June 17 Parker marked 518 fingerling rainbows. In the course of the 1944 angling season 7 of these fish were recovered, 1.35 per cent of the number clipped. Their average size at capture was about 8 1/8 inches and 2.89 ounces. All but one was captured during the latter half of the season. Assuming they were the maximum length of 6 7/8 inches when marked, they grew at least 1 1/4 inches after release. This growth seems excellent under the heavily populated condition of the pond. Since 854.6 pounds were put into the pond in the spring, there was a population density of 488 pounds of rainbow trout per acre at the start of the season.

Anglers recovered six tagged fish through their angling efforts in 1944. Two of these fish had been tagged September 7, 1943; the remaining four were marked on March 24 and 27, 1944, (Table 3). Fish marked the previous fall showed an average gain of 2.15 inches in the average 304 days free.

Fish caught the same year they were tagged grew an average of about 13/16 inches in an average of 57 days between tagging and recapture.

The two fish marked the previous fall were put into the pond but sometime later they moved out of the pond into the stream below and were recovered the following spring in the weir below the dam. On recovery, Parker again put them into the pond. Their slight increase in length indicates that they probably did not move downstream to Lake Huron that winter. Young rainbows that leave the stream to spend a winter in the Great Lakes, but which return to the stream again in the spring, usually grow phenomenally fast during their first visit to the "big waters."

Table 3

RECOVERY DATA OF TAGGED RAINBOW TROUT CAUGHT IN

GUILEY POND DURING THE 1944 TROUT FISHING SEASON

Tag number	Date tagged	Date recovered	Days free	Length in mm. at tagging	Length in mm. at recovery	Gain in length	Weight in oz. at tagging	Weight in oz. at recovery	Gain in weight
16,951	3/24/44	4/29/44	36	190	199	9	2.25	2.50	0.25
16,197	3/24/44	5/10/44	47	209	222	13	3.00	3.75	0.75
16,189	3/24/44	5/11/44	48	190	203	13	2.00	3.00	1.00
25,937	3/27/44	7/2/44	97	186	232	46	2.00	4.00	2.00
16,161	9/7/43	7/7/44	303	178	234	56	1.75	4.75	3.00
16,151	9/7/43	7/9/44	305	177	230	53	1.75	4.25	2.50

All reported recoveries of marked fish taken elsewhere than in the pond in 1944 were taken either in the lower Guiley or in the East Branch of the Au Gres River (Table 4). Thirteen marked trout were recovered in 1944 that had sometime previous been handled by Mr. Parker at Guiley Pond. Of the 13 recoveries, 2 were fin clipped (dorsal fin in each instance) and 11 tagged. Both fin-clipped fish and 7 of the tagged trout taken during the 1944 season had been marked by Parker that same year. Three other tagged fish were marked in September, 1943, and another was a straggler from the September markings in 1942.

Only three of the marked fish recovered were measured by Parker. Lengths given for the remaining nine (no length is listed for fish tag 50180) are only in part correct. Eight of nine are estimated lengths and the one remaining fish was measured by an angler and reported to the local conservation officer, who in turn reported the recovery to Parker.

The length of time that elapsed between marking and recovery is likewise known for only a part of the fish. Of course there is no way of telling exactly when in 1944 the recovered fin-clipped fish were marked so it would only be a guess to say how many days these fish had spent in the pond and stream since marking, and only the approximate date of recovery of 8 tagged fish was reported, i.e. two anglers who had fished the Au Gres 16 and 19 days each reported the number of marked fish they took during these periods of angling but not the day each fish was taken. Hence the time of capture was assumed to be midway in these periods and the days out were figured from the date of tagging to this date. For example, one angler fished from May 4 to May 20, or sixteen days. The day of capture of the five marked fish he recovered was assumed to be May 12.

Since the length of the fish at recovery and the exact time free are only approximately correct, the gain in length and total days out have been figured but a + and - sign are affixed.

Table 4

RECOVERY DATA FOR MARKED BROOK TROUT AND RAINBOW TROUT

RECOVERED ELSEWHERE THAN IN GUILEY POND

Marking	Species of trout	Date marked	Date recovered	Days out	Length (in.) at marking	Length (in.) at recovery	Gain in length	Where taken
Tag 16,157	Brook	9/8/43	5/15/44	249	7.60	8.75	1.15	3/4 mile below M-55
16,162	Brook	9/8/43	5/4-20/44	383 + or -	9.02	11.00✓	1.98 + or -	Lower East Branch Au Gres
16,165	Brook	9/8/43	5/4-20/44	383 + or -	8.35	11.00✓	2.65 + or -	Lower East Branch Au Gres
38,563	Rainbow	4/20/44	5/17/44	27	7.95	8.23	0.28	East Branch Au Gres River
16,968	Rainbow	3/24/44	5/4-20/44	49 + or -	8.78	11.00✓	2.22 + or -	Lower East Branch Au Gres
16,996	Rainbow	3/24/44	5/4-20/44	49 + or -	9.09	11.00✓	1.91 + or -	Lower East Branch Au Gres
25,926	Rainbow	3/25/44	5/4-20/44	216 + or -	7.40	8.00✓	0.60 + or -	Lower East Branch Au Gres
38,536	Rainbow	4/17/44	5/1-20/44	23 + or -	7.52	8.50✓	0.98 + or -	E. Br. Au Gres R. near M-55
38,512	Rainbow	4/6/44	5/1-20/44	34 + or -	8.50	10.00✓	1.50 + or -	E. Br. Au Gres R. near M-55
25,938	Rainbow	3/27/44	5/1-20/44	49 + or -	8.39	10.00✓	1.61 + or -	E. Br. Au Gres R. near M-55
50,180	Rainbow	9/11/42	5/7/44	746	23.94	?	?	E. Br. Au Gres 1 mile below M-55
Clipped-dorsal	Rainbow	Spring '44	7/2/44	?	?	7.17	?	E. Br. Au Gres 1 mile below Guiley Pond
Clipped-dorsal	Rainbow	Spring '44	7/2/44	?	?	7.20	?	E. Br. Au Gres 1 mile below Guiley Pond

✓ Approximate lengths as reported by anglers.

There were only two recoveries reported for which we have reliable data. One rainbow was taken one mile downstream from Guiley Creek in the East Branch of the Au Gres River 27 days after being marked by Parker. It grew 0.25 inches over that period of time. A brook trout about 7 5/8 inches long when tagged was recovered 249 days later and had grown approximately 1 1/8 inches after being tagged.

Number and Per Cent of Anglers Catching Various Numbers of Trout

Nearly 80 per cent of the angling days listed for the 1944 season were unsuccessful (Table 5). On the 200 occasions that anglers were successful they caught from one to nine trout. There were 108 anglers who caught only one trout, half that number caught only 2 fish, while 27 reported taking 3 trout. Six and two anglers caught 4 and 5 trout respectively. There were records of only one angler taking 6, 7, and 8 trout each. Although no angler took the pond limit of ten fish, 44 anglers did fill their limit of one fish of four pounds or no more than five pounds of fish.

Table 5

NUMBER AND PERCENTAGE ANGLING DAYS RECORDED IN THE CAPTURE OF VARIOUS NUMBERS OF LEGAL BROOK AND RAINBOW TROUT IN GUILEY POND - 1944

Item	Number and percentage of fisherman days in which various numbers of brook and rainbow trout were caught																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
Number	796	108	54	27	6	2	1	1	1	0	0	0	0	0	0	0	996
Percentage	79.92	10.85	5.42	2.71	0.60	0.20	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Residence of Anglers

Over the 1944 season 858 resident and 3 non-resident anglers visited the pond (Table 6). A total of 135 other anglers also fished the pond but were not contacted so their residence is not known.

Table 6

RESIDENCE OF ANGLERS FISHING GUILEY POND 1944

RESIDENT ANGLERS LISTED BY COUNTIES, NON-RESIDENTS BY STATES

Resident anglers	
County	Number of anglers
Alcona	3
Alpena	1
Arenac	7
Bay	57
Calhoun	1
Eaton	3
Genesee	148
Ingham	10
Iosco	118
Isabella	5
Livingston	11
Macomb	1
Montmorency	6
Oakland	50
Ogemaw	63
Saginaw	167
Tuscola	4
Washtenaw	16
Wayne	187
Totals	858

Non-resident anglers	
State	Number of anglers
Illinois	2
Tennessee	1
	3

GRAND TOTALS

Residents	858
Non-residents	3
	861
Residence unknown	135
	996

Resident anglers came from 19 different counties in the state, all in the Lower Peninsula. The majority of the anglers were residents of the eastern half of the state and most of these were from metropolitan areas such as Flint, Saginaw, Bay City, Pontiac, and Detroit. The five leading counties from whence most of the anglers came were Wayne, Saginaw, Genesee, Iosco, and Ogemaw. Iosco is the county where Guiley Pond is situated and Ogemaw is the adjoining county to the west. Three non-resident anglers came from Illinois and Tennessee, two being natives of the former state and one a resident of the latter.

Food Studies on Trout Taken in Guiley Pond by Angling During the 1942 Trout Season

In 1942, stomachs from better than one-half of the trout catch (106 of 195 rainbow trout, 107 of 166 brook trout) were preserved in weak formalin after capture. Each stomach was wrapped separately in cheese-cloth with a label bearing the date and data on the captured fish. The stomachs have been examined by Mrs. J. W. Leonard, at the Ann Arbor laboratory, and the food items found in the stomachs tabulated in considerable detail. Because of the size of the final tables, the tabulations were condensed into the form and size presented here.

One hundred and six rainbow trout stomachs were examined; 34 were empty and two had no data given. Seventy stomachs were used in the table based on lengths. Date of catch was not given for eight fish. No information was given for four of the 34 empty stomachs.

Of the brook trout preserved, 100 had food and seven were empty. Date of catch was given for very few of the brook trout.

The food of the rainbow trout was analyzed by two-week periods regardless of sex, by sex regardless of time, and by size groups regardless of sex or time. The brook trout data were analyzed by size groups only, as the dates of capture were not given for this species, nor was the sex.

Table 7

FOOD ITEMS COMPRISING THE DIET OF RAINBOW TROUT OF DIFFERENT SIZES, GUILEY POND, 1942 TROUT SEASON, GIVING PERCENTAGES OF THE TOTAL VOLUME CONSUMED MADE UP BY THE VARIOUS ITEMS.

(Figures in parentheses indicate number of empty stomachs in each size group.)

Item	Range in total length (mm.)						Totals
	200-299	300-399	400-499	500-599	600-699	700-799	
Number of stomachs examined from each group	5 (0)	5 (1)	35 (8)	20 (10)	4 (12)	1 (0)	70 (31)
Range in weight (oz.)	2.5-21.0	11.0-21.0	17.0-42.0	34.5-88.5	67.0-96.5	76.0	2.5-96.5
FOOD ITEMS							
Crustacea	3.7	34.3	0.5	...	...	...	6.2
Aquatic Insects	30.6	43.3	70.0	11.3	trace	60.0	40.0
Gordeacea	1.1	...	...	0.1	...	...	0.2
Araneae	0.1	...	0.2	...	...	...	0.1
Terrestrial Insects	8.9	5.8	3.6	0.4	...	40.0	3.4
Fish	...	...	...	84.6	...	...	30.5
Vegetation	0.5	1.1	7.6	2.3	...	...	3.9
Animal debris	55.1	15.5	18.1	1.3	100.0	...	15.7
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Rainbow Food by Size Groups

A total of 70 stomachs with food were examined. Thirty-one stomachs were empty. The number of empty stomachs in each size group is shown in parentheses in Table 7. It will be noted that the number of empty stomachs increased with the size of the fish. This may indicate that the larger fish do not attempt to feed except to maintain the weight of their body after spawning.

Judged by the percentage of the total volume of food items found in the stomachs examined, the following are the three main forms of diet for the rainbow trout--aquatic insects, fish, and animal debris. The dominant aquatic insects observed were mayflies (Ephemeridae), dragonflies (Anisoptera), stoneflies (Plecoptera), water boatmen (Corixidae), water scavenger beetles (Hydrophilidae), caddisflies (Limnophilidae), and midges (Chironomidae). The only fish appearing in the rainbow trout stomachs was the common sucker,[2] and there were only three stomachs found containing one each. Their bulk, however, made up over 80 per cent of the volume of the food consumed within the size groups where they were found.

A change in the diet preferred is apparent with an increase in size. The three main items in the diet of each of the size groups was as follows:

200-299 mm. - Animal debris, aquatic insects, terrestrial insects.

300-399 mm. - Aquatic insects, Crustacea, animal debris.

400-499 mm. - Aquatic insects, vegetation, terrestrial insects.

500-599 mm. - Fish, aquatic insects, vegetation.

600-699 mm. - Vegetation, aquatic insects.

700-799 mm. - Aquatic insects, terrestrial insects.

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[2] Identified by Dr. Karl Lagler, Zoology Department, University of Michigan.

The portion of the diet made up of aquatic insects apparently increases with size in fish between 200 and 500 mm. in length. From that size on, the percentage of aquatic insects in stomachs showed a decrease, except for the single specimen in the 700-799 mm. group. Terrestrial insects were most numerous in the smallest size group, and were found in less abundance as the size of the fish increased, and were found in few fish over 500 mm.

Fish were found in only three stomachs, and these in the 500-599 mm. size group.

The amount of vegetation (water plant parts and algae) appeared to increase with the size of the fish, while animal debris appeared to decrease with increases in body size.

Rainbow Food by Sex

The sex of 60 fish whose stomachs contained food was recorded; there were 32 females and 28 males. The sex of the fish with stomachs empty is not known. From the data in Table 8, it would appear that male rainbow trout eat aquatic insects, animal debris, vegetation, and terrestrial insects in that order. These foods made up over 99 per cent of the total volume of food found in the male stomachs, with aquatic insects consisting of two-thirds of the total volume.

Female rainbow trout had eaten fish, aquatic insects, animal debris, vegetation, and terrestrial insects in that order. Fish comprised over two-thirds of the volume of the food eaten by the females. In contrast no fish were found in male rainbow trout stomachs. If the fish were excluded from consideration, the volume of food found per stomach would have been twice as large for male fish as for female fish.

Table 8

PERCENTAGES OF TOTAL VOLUME OF FOOD CONSUMED BY 60 RAINBOW TROUT OF DIFFERENT SEXES FROM GUILEY POND, 1942 TROUT SEASON

Item	28 ♂	32 ♀	Total
Crustacea	0.6	...	0.2
Aquatic insects	66.6	25.8	42.0
Gordeacea	0.1	0.0	0.1
Araneae	0.1	Trace	0.1
Terrestrial insects	1.6	0.5	0.9
Fish	0.0	68.4	41.1
Vegetation	9.2	1.9	4.8
Animal debris	21.8	3.4	10.8
Total	100.0	100.0	100.0

Rainbow Food By Two-week Periods

Tabulation of food items eaten by 62 rainbow trout in the various two-week periods of the season revealed no regular trends in their diets as related to the time of the season (Table 9). With the exception of fish, the other items of importance (aquatic insects, animal debris, vegetation, and terrestrial insects) were present in varying percentages of abundance at almost all times. Only during the period August 16-31 was the food consumed quite different; in that period fish made up 92+ per cent of the total volume, aquatic insects almost 6- per cent, and vegetation 2- per cent. This was the only period in which fish were consumed.

Brook Trout Stomachs

One hundred and seven brook trout stomachs were opened and the contents examined; seven were found to be empty. Stomach analyses of two fish less than 200 mm. and of two fish longer than 300 mm. will be found in Table 10. The remaining 96 stomachs were from brook trout between 200 and 299 mm. in size.

The smallest size group (100-199 mm., not taken by anglers) contained aquatic insects, animal debris, Crustacea, terrestrial insects, and spiders in that order. Aquatic insects made up 62 per cent of the total volume of the food consumed.

As the table demonstrates, the 96 brook trout between 200 and 299 mm. were omnivorous. The five main items in their diet were aquatic insects (46.9 per cent by volume), animal debris (21.6 per cent), fish (8.2 per cent) of the species *Cottus* and *Catostomus*[3] (muddlers and suckers), terrestrial insects (7.2 per cent), and Crustacea (7.1 per cent). Annelids, roundworms, spiders, millipedes, a shrew, stones, and vegetation made up the remaining 9 per cent of the food.

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[3] Identified by Dr. Karl Lagler, Zoology Department, University of Michigan.

Table 9

PERCENTAGE OF TOTAL VOLUME OF FOOD CONSUMED BY RAINBOW TROUT

GROUPED BY TWO-WEEK PERIODS, GUILEY POND, 1942 TROUT SEASON

Item	April 16-30	May 16-31	June 1-15	June 15-30	July 1-15	July 16-31	August 1-15	August 16-31	All fish
Number of rainbow trout stomachs from each period with food	11	27	7	4	3	4	1	5	62
FOOD ITEMS									
Crustacea	...	...	3.1	...	...	Trace	...	...	0.2
Aquatic insects	45.7	86.6	44.1	65.7	30.1	83.3	60.9	5.9	41.8
Gordeacea	...	...	...	...	...	...	2.6	...	0.1
Arachnida	0.5	...	...	7.1	...	...	...	...	0.1
Terrestrial insects	1.6	0.4	3.3	2.9	1.1	4.4	...	...	0.9
Fish	...	...	...	...	...	...	...	92.5	38.8
Vegetation	2.0	3.7	0.6	2.9	36.9	2.6	1.7	1.6	4.6
Animal debris	50.2	9.3	48.9	21.4	31.9	9.6	34.8	...	13.5
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 10

FOOD ITEMS COMPRISING THE DIET OF BROOK TROUT OF DIFFERENT SIZES, GUILEY POND, 1942 TROUT SEASON, GIVING PERCENTAGES OF THE TOTAL VOLUME CONSUMED MADE UP BY THE VARIOUS ITEMS.

Item	Range in total length (mm.) 100-199	200-299	300-399	Totals ...
Number of stomachs examined from each group	2	96	2	100
Range in weight of trout (oz.)	2.50-2.75	2.75-9.25	3.25-5.25	2.50-9.25
FOOD ITEMS				
Annelida	...	1.9	...	1.9
Crustacea	11.4	7.1	84.8	8.3
Aquatic insects	61.8	46.9	8.5	48.4
Arachnida	trace	0.1	...	0.1
Round worms	...	0.1	...	0.1
Terrestrial insects	1.1	7.2	...	7.0
Millipedes	...	0.1	...	0.0+
Shrews	...	3.4	...	3.3
Fish	...	8.2	...	8.0
Stones	...	0.3	...	0.2
Vegetation	...	3.0	0.6	0.5
Animal debris	25.7	21.7	6.1	22.2
Totals	100.0	100.0	100.0	100.0

The four items in the stomachs in the two largest fish were as follows: Crustacea, 84.8 per cent; aquatic insects, 8.4 per cent; animal debris, 6.1 per cent; and vegetation 0.6 per cent.

In summarizing the results of this food study, the most important point to emphasize is that fish of any kind do not comprise even a minor part of the diet of the trout in the pond. In the rainbow trout, fish constituted less than one per cent of the total number of individuals encountered in the stomachs even though they made up about 30 per cent of the total volume of food consumed (Table 7). The situation was similar in the brook trout stomachs examined, except that the fish made up only about 1/4 as much of the total volume (Table 10). No young trout were found in the stomachs of either brook or rainbow trout.

On the diets observed, it has been demonstrated through the tagging and fin-clipping work that the smaller size groups of rainbow trout (up to 300 mm.) can gain weight and increase in length while residing in the pond. However, it appears that the food available is not sufficient to replace the weight lost by spawning among the larger mature fish.

Summary of General Statistics

The main features of the pertinent statistics are summarized in Table 11. From this table it will be noted that the spawning run of 1944 was the lowest yet observed. However, the average size of the rainbow trout transferred into the pond was excellent.

Despite war-time exigencies, angling pressure in 1944 on the pond increased about 24 per cent over 1943.

Although the rainbow trout catch was low in numbers, the average size (2.6 pounds) of the fish taken was the highest yet noted. The brook trout appear to be increasing yearly, since the numbers in the catch have grown larger each year since 1941 despite no planting or transference. The average weight in 1944 (0.26 pounds) was also the

Table 11

GENERAL SUMMARY OF ADULT RAINBOW TROUT TRANSFERRED INTO

GUILEY POND AND THE RESULTING CATCH DURING THE SEASONS 1940-1944 INCLUSIVE

(Average weights of fish are given in parentheses.)

Year	Rainbow running		Hours of angling	Rainbow trout caught		Brook trout caught		Catch per hour				% of rainbow run taken by anglers	
	Number	Weight (lbs.)		Number	Weight (lbs.)	Number	Weight (lbs.)	Rainbow Number	Rainbow Pounds	Brook Number	Brook Pounds	Number	Weight
1940	Not known		1,452.50	150	244.4 (1.6)	235	51.1 (0.21)	0.10	0.168	0.16	0.035	Not known	
1941	252	1,031.2 (4.1)	2,440.25	104	193.6 (1.9)	299	68.7 (0.22)	0.04	0.079	0.12	0.028	41.2	18.8
1942	310	1,233.3 (4.0)	3,839.00	195	491.2 (2.5)	166	42.5 (0.25)	0.05	0.128	0.04	0.011	62.9	39.8
1943	329	961.8 (2.9)	1,765.50	195	460.2 (2.4)	180	47.5 (0.25)	0.11	0.261	0.10	0.027	59.2	47.9
1944	196	806.1 (4.1)	2,176.25	138	362.9 (2.6)	215	56.1 (0.26)	0.06	0.166	0.10	0.025	70.4	45.0

highest recorded to date.

The angling quality has been best in those years when there was less than 2,000 hours of fishing. The 1944 quality was down about 25 per cent when compared with 1943.

In 1944, slightly more than 70 per cent of the mature spawners transferred were taken by anglers, and these fish comprised 45 per cent of the total weight of the spawners at the time of transferral.

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