Original: Fish Division
cc: Education-Game
Dr. Leonard
Dr. Shetter

INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

April 28, 1941

REPORT NO. 662

NOTES ON THE FEEDING HABITS OF BROOK TROUT IN EAST FISH LAKE, MONTMORENCY COUNTY, MICHIGAN, HUNT CREEK EXPERIMENTAL AREA, DURING THE SUMMER OF 1940

by

Justin W. Leonard

East Fish Lake is the largest of three small bodies of water lying in Sections 34 and 35 of T. 29 N., R. 2 E., Montmorency County, near the Hunt Creek Experiment Station. It is obvious from the terrain that East Fish was not long ago the lowest in a chain including Middle and West Fish lakes. The chain has been broken, probably for at least 20 years, by subsiding water levels, although short spring-fed tributaries enter East Fish, and during periods of exceptionally heavy rainfall the old connecting channels may flow with drainage water for short intervals of time. The outlet of the lake, which flows constantly, is tributary to Fuller Creek, which in turn enters Hunt Creek near the upper end of Section B.

At present the lake has a surface area of approximately 13.5 acres. A few years ago the area was probably nearly 20 acres; the loss was due chiefly to the removal of two beaver dams at the outlet, as a result of which the level was lowered by about 1.5 feet. Institute surveys have

shown that the basin is composed of marl, with accumulations of pulpy peat which cover, approximately, that part of the basin enclosed by the 30-foot contour line. The maximum depth is about 42 feet (see Institute survey map of July 5, 1939). Submerged aquatic vegetation is of scanty occurrence in the lake. Bottom samples taken during the 1939 summer survey indicated a very poor production of bottom fauna. Shetter (Reports No. 555 and 644) has called attention to the apparent poverty of the natural food supply, and to the presence in the lake of large numbers of horned dace and small yellow perch, in addition to brook trout. Other forage species, including common shiner, black-nosed shiner, common sucker, and Iowa darter, are present.

Shetter (loc. cit.) has noted that legal-length brook trout of hatchery origin lost weight after being planted in East Fish Lake on April 22, shortly before the opening of the 1940 trout season. While planting shock might account for some temporary loss, it is probable that the poor food supply was chiefly to blame.

During the 1940 fishing season, 172 legal trout were removed from East Fish Lake. Of this number, only 12 stomachs containing food were available for study. Three were from wild trout, one taken July 20, and two July 28; the 9 remaining fish were from the April planting, and were caught on May 4.

The feeding habits of these fish are shown in Tables 1 and 2. The former summarizes the diet by major groups of food organisms, listed in order of importance on a volumetric basis. The latter shows distribution, frequency of occurrence and numbers of individuals present, arranged in phylogenetic order among the invertebrates.

From the standpoint of sheer bulk, 2 horned dace accounted for nearly three-fourths of the total volume. Next ranked mayfly nymphs, especially

those of the burrowing species Hexagenia occulta. These insects appeared to be most numerous in the shallows near shore, although in other waters they have been found in abundance in depths of 30 feet or more. If the bulk of insects alone were considered in computing percentages, mayflies would compose nearly 69 per cent of the total diet.

Two large angleworms ranked third in volume. They were almost certainly taken as bait.

Midges occurred but sparingly in the stomachs. A total of 30 adult flies, apparently blackflies, were consumed. They probably spent their aquatic life in the outlet or inlet streams, or in both, for it is well known that blackfly larvae require shallow, rapidly-flowing water. The same applied to the solitary stonefly adult encountered in one stomach.

With the exception of the few midge larvae and pupae, the aquatic insects were probably taken in the littoral zone, the shallow water near shore. A negligible amount of surface food was eaten.

Marl lakes are notoriously unproductive. It is possible that, by raising the lake level a foot or two so as to flood the extensive shoal area left exposed by the removal of the beaver dams, and the sparse terrestrial vegetation growing there, a slight temporary increase in food production, especially of plankton, might be brought about. It is worthy of notice that no plankton was found in any of the 12 stomachs. It is unlikely, however, that beneficial effects of a raised water level would endure for more than a very few years.

Only 2 of the 12 stomachs examined contained fish (horned dace in each instance). If this is a fair indication of the extent to which the forage species are utilized by the trout in East Fish Lake, it must be concluded that the forage species might better be eradicated. Enough is known of their feeding habits, especially those of perch and horned dace,

to support the categorical statement that they are direct food competitors of the trout. If the minnows and perch were eliminated, more invertebrate food organisms should be available to the trout. The perch themselves are of little importance to the fishery, for they are stunted and in poor condition.

The advisability of removing the entire population of East Fish Lake by rotenone treatment has been discussed frequently by members of the Institute staff. It has been considered as very probable that the quality of the trout fishing could be considerably improved by such procedure. By adding gravel to the small inlet stream, conditions there could be rendered suitable for natural reproduction by a number of trout. With the competitive perch and coarse fish removed, more of the meager food supply would be directly available to the trout. Temperature conditions in the lake are such as to render trout angling productive only during the first two months of the season, and occasionally near the end of the season. It seems reasonable to suppose, therefore, that a self-maintaining trout population might be established in the lake.

The only drawback to entering upon the procedure just outlined lies in the difficulties that might be encountered in trying to retain all outflow from the lake for a period of time adequate to permit the toxicity of the treated water to drop below a point lethal to fish in the outlet stream, Fuller Creek, and Hunt Creek. It may be possible to throw a temporary dam across the outlet at a point where high ground encroaches from either side to form a relatively narrow opening.

According to Shetter's calculations (Report No. 644), the theoretical number of legal-length trout present in the lake at the close of the 1940

season was: 42 wild trout, and 120 marked trout of hatchery origin. In October of 1940, marked legal-length trout (243 in number) were planted, and it is planned to introduce 250 more in April of the present year. Population removal, if attempted, would be carried out after the close of the 1941 trout season, and, in addition to improving conditions for trout production, would supply a very useful check on the accuracy of the theoretical method of calculating the total population.

INSTITUTE FOR FISHERIES RESEARCH

By J. W. Leonard
Aquatic Biologist

Report approved by: A. S. Hazzard

Report typed by: V. Andres

TABLE 1. CONTENTS OF 12 BROOK TROUT STOMACHS TAKEN ON HOOK AND LINE FROM EAST FISH LAKE, MONTMORENCY COUNTY, HUNT CREEK EXPERIMENTAL AREA, SUMMARIZED BY MAJOR GROUPS OF FOOD ORGANISMS ON A VOLUMETRIC BASIS. INCLUDED ARE 3 WILD AND 9 HATCHERY FISH. TROUT SEASON, 1940.

Organism	Number of individuals	Per cent total volume
PISCES (Fish: horned dace)	2	70.3
EPHEMEROPTERA (Mayflies)	46	17.1
ANNELIDA (Earthworms: bait)	2	4.8
COLEOPTERA (Land beetles)	3	2.3
ODONATA (Dragonflies)	2	1.6
NEUROPTERA (Fish flies)	1	1.6
HEMIPTERA (Water bugs)	5	1.1
DIPTERA (True flies, aquatic origin)	74	1.0
COLEOPTERA (Water beetles)	3	0.2
PLECOPTERA (Stoneflies)	1	trace
TRICHOPTERA (Caddisflies)	1	trace
DIPTERA (True flies, terrestrial origin)	1	trace
		100.0

TABLE 2. CONTENTS OF 12 BROOK TROUT STOMACHS TAKEN ON HOOK AND LINE FROM EAST FISH LAKE, MONTMORENCY COUNTY, HUNT CREEK EXPERIMENTAL AREA. NINE HATCHERY FISH (PLANTED APRIL 22) TAKEN MAY 4; THREE WILD FISH, ONE TAKEN JULY 20, TWO ON JULY 28, 1940. SIZES AND WEIGHTS NOT AVAILABLE. ALL TAKEN ON WORMS OR MINNOWS.

Organism	No. individuals	No. stomachs containing organism	Most in any stomach	Least in any stomach	Ave. No. in stomachs containing them	Per cent of total volume, less debris
ANNELIDA (EARTHWORMS: BAIT)	2	2	1	1	1	4.8
NEUROPTERA (DOBSON FLIES, ETC.)						
Chauliodes sp. - L	1	1	1	1	1	1.6
EPHEMEROPTERA (MAYFLIES)						
Ephemeridae - N (fragments)	6	4	2	1	1.5	0.2
Hexagenia sp. - N	39	6	14	1	6.5	16.7
Ephemerella sp. - N	1	1	1	1	1	0.2
ODONATA (Dragonflies)						
Family ? - N (fragments)	2	2	1	1	1	1.6
PLECOPTERA (STONEFLIES)						
Family ? - A (fragments)	1	1	1	1	1	trace
HEMIPTERA (WATER BUGS: WATER BOATMEN)						
Corixidae	5	3	2	1	1.6	1.1
COLEOPTERA (WATER BEETLES)						
Gyrinidae - A	3	3	1	1	1	0.2
TRICHOPTERA (CADDISFLIES)						
Limnephilidae - L	1	1	1	1	1	trace
DIPTERA (TRUE FLIES: MIDGES)						
Chironomidae - A	6	2	5	1	3	trace
Chironomidae - P	29	3	26	1	9.6	0.5
Chironomidae - L	9	4	6	1	2.5	0.5
Simuliidae - A	30	1	30	30	30	trace
COLEOPTERA (LAND BEETLES)						
Scarabaeidae - A	2	1	2	2	2	2.1
Family ? - A	1	1	1	1	1	0.2
DIPTERA (LAND FLIES)						
Lonchopteridae - A	1	1	1	1	1	trace
PISCES (FISH)						
Semotilus atromaculatus	2	2	1	1	1	70.3
						100.0

Identifiable food organisms .... 94.6 per cent
Animal debris ..... 5.2 per cent
Plant debris ..... 0.2 per cent