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Report on toxicity to fish of Rouge River, based
on fish and water samples collected by employees
of the Stream Control Commission

April 9-April 23, 1947

by

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On April 9, 1947, Messrs. F. B. Frost and F. E. Jones, employees of the Michigan Stream Control Commission, brought to the Institute for Fisheries Research 3 adult walleyes (Stizostedion v. vitreum) which they had picked up in the River Rouge about 100 yards above the mouth. These specimens were brought in still alive, in a 10-gallon can of water. The collectors reported, however, that the fish had appeared dead, or at least moribund, when picked up. The specimens were autopsied immediately by the writers. Autopsy results are detailed in Appendix I; results stated briefly were that in all three specimens the liver and kidneys appeared abnormal, decidedly so in two of them, in which the livers were excessively pale and the tissue "mushy" in texture, and in which the kidneys appeared far atrophied, very small, and the tubules (having considerable elasticity in healthy tissue) quite fragile and semi-liquified. None of the fish was heavily parasitized.

In an effort to localize the source of the toxicity in the stream presumed to be responsible for the condition of the fish, the field investigators collected three samples of River Rouge water in sterile 1-gallon jugs. These samples were taken (1) near the mouth of the river, at the time and place where the three walleyes were collected; (2) near the bridge of the Detroit, Toledo and Ironton Railroad; and (3) at the Jefferson Street crossing. Samples 2 and 3 were taken April 10. All were brought to the Institute laboratories for testing with fish.

Experiments were set up immediately to determine the toxicity of the three samples under controlled conditions. Creek chubs (Semotilus a. atromaculatus) ranging in length from 2.75 to 3.5 inches from a homogeneous, pond-reared stock 11 months old were obtained from a commercial bait dealer for use as test animals. Four of these minnows were introduced into each of the three samples, which had been transferred without dilution to clean glass test jars and provided with aeration transmitted from the laboratory compressed-air line by means of rubber tubes with ceramic air-breakers. Other minnows were placed in similar jars filled with water derived from the bait dealer's tanks, to serve as controls.

Fish placed in Sample 1 showed some signs of distress after 85 minutes of exposure to the water, which had a noticeable odor of petroleum. However, none of these fish died after a week of exposure, and after two days the odor of petroleum was no longer apparent.

Fish in Sample 2 seemed unaffected throughout a period of seven days' exposure.

Fish in Sample 3, from the Jefferson Street crossing of the Rouge, were visibly affected after 5 minutes of exposure. Fifteen minutes after the fish were placed in the test jar, one of them had lost its equilibrium.

By the time 65 minutes had elapsed, all four of the fish had lost their equilibrium, and their respiratory movements were irregular and very slow. Two hours after inception of the test, all four fish in Sample 2 were dead.

To verify the results obtained from the test of Sample 3, the experiment was repeated using two test fish. In this run both fish had ceased breathing 30 minutes after being placed in the sample, although they still would react to mechanical stimuli. After the re-check experiment had run 70 minutes both fish were dead.

Throughout the week-long duration of the tests, no fish died in the control jars or in Samples 1 and 2, although, as has been stated, fish in Sample 1 displayed temporary distress, which later vanished.

It is concluded that Sample 3, collected at the Jefferson Street crossing of the River Rouge, contained some violently toxic substance or substances in concentration capable of rendering fish helpless after 5 to 15 minutes of immersion, and of killing them within 2 hours. Of the three samples tested, No. 3 must, therefore, have been taken at the point closest to the source of contamination. It is understood that representatives of the Stream Control Commission will collect additional samples with the idea of definitely localizing this point.

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Appendix I

No. 1. Female, length 19-1/2 inches.--

Specimen alive but moribund. Body free from external lesions, clean and healthy in superficial appearance. Gills somewhat darker in color than normal, carrying light infestation of copepod gill-lice.

Stomach empty of food, four small digenetic trematode worms attached to wall. Stomach, intestine, heart, spleen, swim bladder and mesenteries normal in appearance and free from parasites except as noted. Heavy fat deposits around gastrointestinal tract. Ovaries large, well-developed, eggs not yet ripe. Liver abnormally pale and very "mushy" in texture; no parasites revealed by sections at 1/4-inch intervals. Kidneys very pale and strongly atrophied, nephritic tubules fragile. No parasites found in muscle tissue.

No. 2. Male, length 13-1/2 inches.--

Specimen alive but moribund. Body free from external lesions, clean and healthy in superficial appearance. Gill color normal, filaments with moderately heavy infestation of copepod gill-lice.

Stomach empty of food and free of parasitic worms. Stomach, intestine, heart, spleen, swim bladder and mesenteries free from parasites. Heavy fat deposits around gastrointestinal tract. Testes large, well developed, nearly ripe. Liver pale, although darker than that of No. 1, and somewhat "mushy" in texture; no parasites revealed by sections at 1/4-inch intervals. Kidneys very pale and atrophied, nephritic tubules fragile. No parasites found in muscle tissue.

Appendix I (Continued)

No. 3. Male, 15 inches long.--

Specimen alive but moribund. Body free from external lesions, clean and healthy in superficial appearance. Gill color normal, filaments very lightly infested with copepod gill-lice.

Stomach empty of food and free of parasitic worms. Stomach, intestine, heart, spleen, swim bladder and mesenteries free from parasites. Considerable fat around gastrointestinal tract. Testes large, well developed, not quite ripe. Liver darkest of the three examined but still paler than normal; texture unremarkable; one liverfluke revealed by sections made at 1/4-inch intervals. Kidneys paler than normal, but little if any sign of atrophy, nephritic tubules normal. No parasites found in muscle tissue.