MONTANA STATE DEPARTMENT OF FISH AND GAME
HELENA, MONTANA
14 JUNE 1956

SUBJECT: Report of DDT analysis of whitefish collected in the Yellowstone River.

This supplies information supplemental to the other reports issued concerning the 1955 fish mortality on the Yellowstone River, Montana, which was associated with the 1955 spruce budworm control program.

The spruce budworm control operations were conducted in July 1955. To the best of our knowledge, the first observation of fish mortality in the river was about October 10. As weather conditions and time permitted, between March 19 and April 4, 1956, Perry H. Nelson and Boyd R. Opheim, District Fisheries Biologists, of our Department, collected whitefish in the Wanigan-Emigrant area of the Yellowstone River. Whitefish in sluggish condition, swimming in schools were collected with a direct current shocker. In addition, fresh, dead fish were also collected. A control sample of whitefish was collected from the Gallatin River April 13, 1956. These fish were taken to the Chemistry Laboratory of the Montana State College, Bozeman, Montana, for DDT analysis. Our Department received their report on May 3, 1956. A copy of this report is attached.

The Montana State Fish and Game Commission has expressed the need for research under western conditions into the methods and techniques of spruce budworm control operations and into the effects of these operations upon fish and wildlife and upon other related fields. The Commission has been concerned at statements made to the effect that the Yellowstone fish mortality was not related to the budworm control operation, for it appeared that such statements would minimize the need for this research. The Commission has felt that even prior to the tissue analysis for DDT adequate evidence was available to relate the mortality to the budworm control program. The analysis recorded in the attached report certainly establishes the positive relationship between the control program and the Yellowstone fish mortality. If control programs which use substances such as DDT which are toxic to fish and aquatic organisms are important to the western economy, certainly it is equally important that adequate research be conducted, not only into the effects of these operations upon other branches of the economy, but into methods and techniques best adapted to western conditions,

A. A. O'CLAIRE
STATE FISH AND GAME DIRECTOR

C O P Y

The following procedure was used to determine the presence of DDT in the livers, kidneys, and brains of fish caught in the Yellowstone River. A standard curve of concentration of DDT was plotted against the absorbance of its color complex.

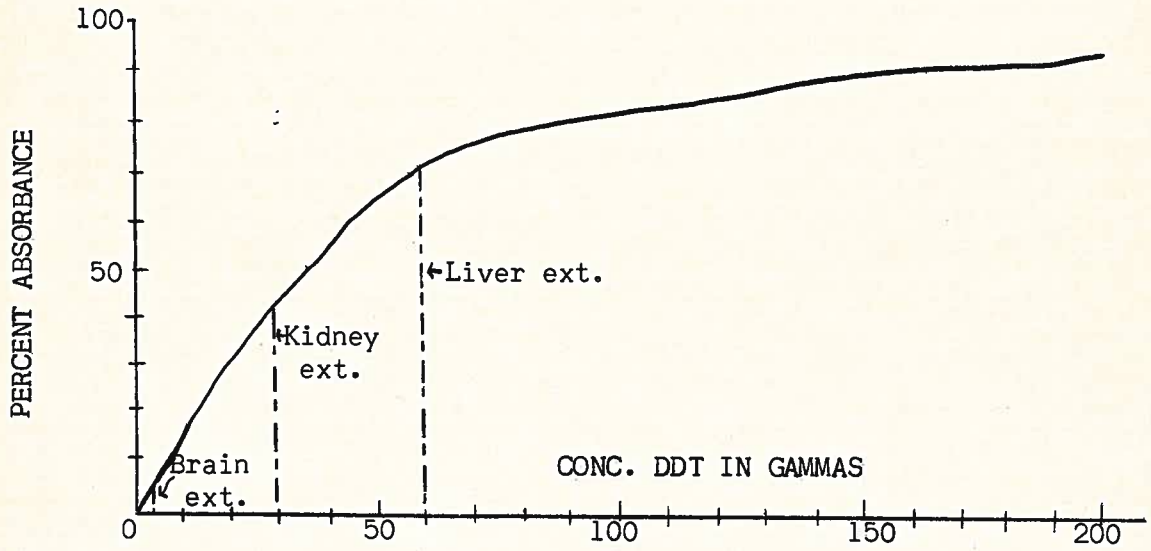
Liver, kidney, and brain specimens were extracted from live whitefish of the Yellowstone. These samples were dried in a vacuum oven to remove any water present and the dried residues finely ground in a mortor. Each sample was weighed and placed in an extraction appartus where the fatty material was extracted with 100 ml. of purified ether.

Ten milliliter samples of the extracts were taken and the ether removed in an oil bath. To each of the residues was added two ml. of Xanthydrol-KOH-Pyridine reagent and the the tubes heated in the oil bath at 120 degrees for eight minutes. After heating the tubes were cooled and checked for the color complex. In some cases the color of the extract interfered with the red color of the complex, and in those tests an increase in the intensity was taken as a positive reaction.

The concentration was then determined by comparison of the unknown absorbance reading with that of the standard color curve. The absorbation readings were taken on a Beckman model-B spectrophotometer.

In all cases with the exception of the control there was an increase in the intensity of the color, which was taken to be a positive test. All tests run on the control specimen appeared to be negative as there was no increase in intensity or decrease in light transmittancy.

The method used is described in detail in Science vol. 101:440 (1945).



Liver extract: dry weight - 11.1745 gm.
conc. DDT - 58 gammas

Kidney extract: dry weight - 2.0559 gm.
conc. DDT - 30 gammas

Brain extract: dry weight - 1.7267 gm.
conc. DDT - 4 gammas*

Kidney extract from fish of Gallatin River (run as control): dry weight - 1.8774 gm.
no DDT indicated

*Method not accurate below 10 gammas