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Research

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**TOXAPHENE (CHLORINATED CAMPHENE) AS A SELECTIVE
FISH POISON**

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Five lakes, known as the Sand Lakes, located in Grand Traverse County in northern Michigan, were treated with 0.010 to 0.025 p.p.m. of emulsifiable toxaphene concentrate (Agricultural Coopertox #6) during October 1956. While gathering dead and dying fish, the authors noted that at these low concentrations of toxaphene small fish died before the large fish. These observations suggested that a lower dosage of toxaphene would eradicate small fish and not injure the larger individuals. To test this hypothesis, Roots Lake, Grand Traverse County, and House Lake, Gladwin County, were treated with toxaphene at concentrations near the 10-day median tolerance limit for goldfish (Doudoroff, Katz, and Tarzwell, 1953).

Roots Lake has an area of 15.6 acres and a maximum depth of 18 feet. The bottom is marl, sand and pulpy peat and supports few submerged plants. A concentration of 0.002 p.p.m. of toxaphene applied to the epilimnion of Roots Lake failed to kill fish.

The remainder of this paper will deal only with the experiment on House Lake. This lake has an area of 4 acres. The littoral zone is covered with snags and deadheads and supports a sparse growth of aquatic plants. The bottom is composed of sand and pulpy peat. The water is hard (methyl orange alkalinity, 130 p.p.m.).

On the afternoon of July 25, 1957 House Lake was treated with 0.005 p.p.m. (5 parts per billion) of emulsifiable toxaphene concentrate. This concentration was calculated only for the water volume of the epilimnion. The toxicant was applied, after diluting the concentrate about 100 fold, by dripping the diluted emulsion from a speeding boat powered with an outboard motor.

The large fish were sampled before and after the treatment with five gill nets of varying mesh sizes (1 1/2-inch to 3-inch stretched). Nets were set overnight in water 5 to 15 feet deep. An attempt was made to set the nets at identical localities and depths before and after treatment, on July 24 and August 1, respectively. Before treatment, the five gill nets caught 26 bluegills averaging 4.3 inches long. One week after treatment, the same netting effort yielded 29 bluegills averaging 4.7 inches, 4 yellow perch averaging 6.2 inches, and 1 largemouth bass 9.9 inches long. These results indicated that the larger fish were not affected by the toxicant at the concentration used. This belief is supported by our failure to find any dead fish (largemouth bass, bluegills, and carp) of large size during frequent observations after treatment.

The effect of the toxicant on small fish was indicated in part by shoreline seining before and after treatment. Twenty hauls with a 30-foot, straight seine, 1/4-inch-bar mesh, were made on each of four days, July 24 and July 25 (before treatment) and August 1 and 2 (one week after treatment). The extremely poor catch on the two days of seining after treatment (Table 1) indicates that few small fish had survived.

The extensive mortality of small fish and the survival of larger fish indicated by seining and gill netting was confirmed by direct observations. On the day after the treatment centrarchids from 1/2-inch to 1-inch long were observed dead and dying along the east shore. A week later numerous dead sunfishes up to 2 1/2 inches long were noted along the shore. At this time, a few small bluegills were still alive although they clearly showed distress symptoms. Specimens captured in seine hauls on August 1 and 2 (a week after treatment) were in this condition. Two weeks after treatment no dying fish

were observed, although healthy largemouth bass and large bluegills could be seen along the shore. On September 13 several largemouth bass up to 14 inches long and 3 pumpkinseeds about 3 inches long were observed.

These results suggest that a concentration of 5 parts per billion of toxaphene can be used to reduce the population of small fish in hard-water lakes without greatly affecting the population of large fish. Further tests are planned to determine whether or not these results can be duplicated on lakes of different size, bottom configuration, and water hardness.

Literature Cited

Doudoroff, Peter, Max Katz, and Clarence M. Tarzwell

1953. Toxicity of some organic insecticides to fish.

Sewage and Industrial Wastes, Vol. 25, No. 7, pp. 840-844.

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Table 1.--Numbers of fish captured in 20 seine hauls on each of
four days in House Lake, Michigan

Species	Before treatment		After treatment	
	July 24	July 25	Aug. 1	Aug. 2
Bluegills	448	363	5	1
Pumpkinseeds	14	6	1	1
Largemouth bass	5
Yellow perch	1
Rock bass	...	1
Total	468	370	6	2