Control of the Clear Lake Gnat in California

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For many years the Clear Lake gnat, *Chaoborus astictopus* D. and S., has been an economic problem to residents along the shores of Clear Lake, California. Research on the biology and habits of this pest has been reported in a series of papers by Lindquist and Deonier (1942, 1943, and 1946). Herms (1941) reported on the abundance and habits of the pest. From 1946 to 1949 studies were conducted periodically at the Corvallis, Oreg., laboratory of the Bureau of Entomology and Plant Quarantine to determine the effectiveness of various new insecticides on the gnat larvae. During the course of this work it was found that TDE (dichlorodiphenyldichloroethane) was highly effective against gnat larvae and was relatively harmless to fish. Two experiments in which TDE was used in two small lakes (Lindquist and Roth 1950) showed that these gnat larvae could be greatly reduced or eliminated in small lakes without undue harm to other aquatic organisms.

After these successful experimental demonstrations, the Board of trustees of the Lake County Mosquito Abatement District made plans for a gnat-control project on Clear Lake. The date for treating the lake was set for mid-September 1949, because at that time of year the larvae are still migrating from the mud into the water each night, it is near the end of the season for adult activity, and the water level in the lake is usually low. It was also believed that there is less likelihood of damaging fish at this time.

The U. S. Coast and Geodetic Survey was asked to determine the volume of water in the lake. The volume of Clear Lake was calculated as 853,624 acre-feet at zero Rumsey gage.[1] The Board also requested State aid in financing the project. The State of California, through the Bureau of Vector Control, made available certain funds to assist the local district. Garth I. Murphy, of the California Division of Fish and Game studied the plankton and fish before and after treatment. J. K. Peterson, a local resident of Lake County, assumed the responsibility for making the arrangements and supervised the application of the insecticide. The Bureau of Entomology and Plant Quarantine provided technical leadership in planning and carrying out the control program.

Plans for the Control Program.—The distribution of approximately 14,000 gallons of insecticide over a lake of this size (41,600 acres) required considerable planning and preparation. Aerial application was considered, but it was estimated that the material could be applied at lower cost by surface craft, and there was less likelihood that adverse weather or breakdown of equipment would interrupt the treatment before it was completed. The operation of surface craft required six large tugboats capable of pulling barges loaded with the insecticide.

The large arm of the lake was divided into six sectors each a mile wide, as shown in figure 1.

To prevent the insecticide from concentrating near the shore and possibly injuring littoral fauna, none was to be discharged within .75 mile of the western shore or 0.5 mile from the eastern shore. It was believed that wave action and water currents would rapidly distribute the chemical evenly throughout the water. Four round trips, or eight swaths approximately 700 feet apart were to be made on each sector. The insecticide was to be discharged by gravity flow direct from 50-gallon drums, as shown in figure 2. A discharge rate of one drum in 20 minutes was obtained by laying the barrel on its side and allowing the fluid to run through a 3-foot length of .625-inch plastic hose with a thin metal spout.

The insecticide was prepared by a chemical company according to the following formula: TDE 30 grams, emulsifier, 10 ml., and xylene 72 ml. The amount of insecticide to be dispersed on each sector was determined by calculating the approximate water depth and surface area. The number of drums employed for each swath is given in figure 1. One drum was discharged continuously as the boat was

[1] A gage established to determine water levels.