

## SOME MOSQUITO-LIKE NUISANCE PESTS AND THEIR ECONOMIC SIGNIFICANCE

BERTRAM I. GERRY

Massachusetts Reclamation Board

For the past two decades, numerous minor midge outbreaks have been reported to the Massachusetts State health authorities, but in only two instances have conditions warranted a comprehensive investigation as the result of these complaints.

1. *Musquashcut Pond.* The first instance, in 1937, involved Musquashcut Pond, in the town of Scituate. (See Fig. 1.) This pond has a water area of approximately 74 acres, with a maximum depth of 4 feet, and an average depth of 2.1 feet. The bottom consists, primarily, of fine sand and some scattered mud deposits. The water is brackish with a chloride content varying from 2,700 to 4,500 parts per million. Although there is no direct sewage discharge into the pond, some pollution occurs as the result of seepage from nearby cesspools, and other sewage works. In the shallow areas, surface temperatures reach 92° F., and bottom temperatures 83° F., during the month of August. The dissolved oxygen content, which varies from 5.4 to 14.0 ppm, is adequate to support fish life.

Between early April and the second week in July of 1937, Musquashcut Pond was stocked with an assortment of fish, which included: smelts, eels, alewives, sticklebacks, killifish, shiners, and white perch. As a result, no midge nuisance occurred during that season. In the meantime, a number of experiments were initiated to determine whether an insecticide might be used effectively for the elimination of *Tendipes decorus* larvae. Data from these experiments showed that pyrethrum flowers, applied at the rate of 1 part flowers to 1,500 parts water, would kill 100 per cent of the midge larvae in 18 hours. However, this type of insecticidal control was not developed beyond

the experimental stage because of the excessive cost. As an alternative, it was recommended: (1) that the pond be restocked with fish, (2) that a screen be installed at the outlet to prevent loss of the fish, and (3) that a plank dam be built at the outlet to increase the depth of the

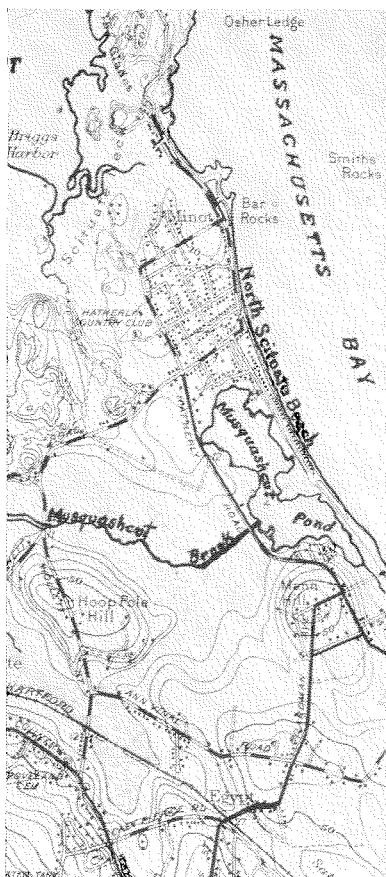


FIG. 1. Musquashcut Pond adjacent to Summer Colony.

pond. Observations, made over a period of ten years (1937 to 1946), indicated that conditions were not improved sufficiently to favor the establishment of a permanent fish population. This conclusion was supported by the recurrence of the midge nuisance. The unusually high temperature of the water, and the generation of hydrogen sulphide in the bottom mud, seem to function as serious limiting factors in respect to fish life, the latter showing, also, a detrimental effect upon midge development. The fact that most fish will succumb to hydrogen sulphide, when present in quantities greater than 1 ppm, has been well established. Although information relative to the tolerance of blood worms to this gas is unavailable, it was noted that these larvae were scarce in the gas-generating mud, but thrived in considerable numbers, where the bottom mud was well diluted with sand. In 1947, a DDT residual spray was applied to all vegetation existing on the land immediately adjacent to the pond. It was anticipated that the midge adults would acquire a lethal dose of DDT while resting on the treated vegetation between flights. This method of attack provided reasonable relief from the midge nuisance, and has been repeated annually, since 1947, at a nominal cost.

2. *Merrimack River.* A more recent midge outbreak occurred along the Merrimack River during 1949 and 1950. A wide divergence exists between the general conditions encountered at Musquashcut Pond, described above, and those found in the Merrimack River area. The Merrimack River is a heavily polluted active stream, with an average June flow of 4,214 million gallons per day over the past 68 years; the chloride content, in the area under observation, ranges from 113 ppm at the narrows, known as the Lion's Mouth (see Fig. 2), to 14 ppm at the upstream end of the ponded area, known as the Middle Ground (see map); the water temperature, taken over a six-year period, from June to November of each year, averaged 68° F. at the sampling station located just below the narrows, and 67° F. at the second sampling station located approximately 10 miles upstream from the first; and the dissolved oxygen content ranged between 1.6 and 3.2 ppm during August—well below that required by fish. The surface of the flats, which extend along both shores of the ponded section of the river, referred to as the Middle Ground, is covered with a layer of blackish organic sludge from 2 to 3 inches in depth. In some areas, where the strength of the current is reduced, this

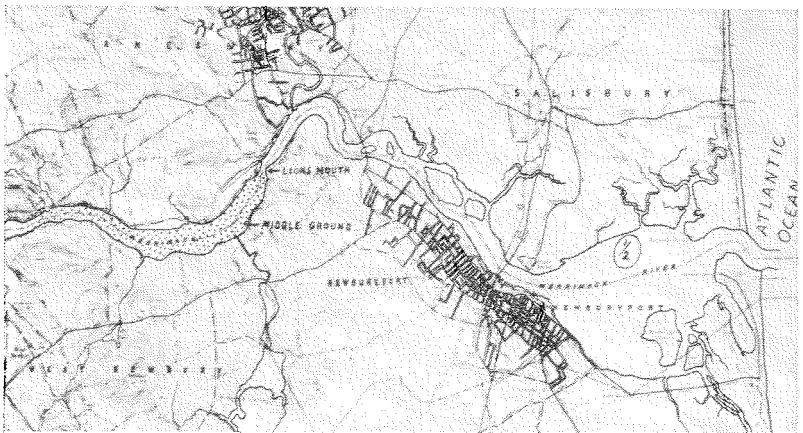


FIG. 2. Merrimack River showing Poned Area.

sludge extends, in irregular patches, well out into the channel. While the muddy areas on the bottom of Musquashcut Pond supported few if any midge larvae, the sludge masses, scattered over the bed of the Merrimack River, harbor larvae of *Glyptotendipes lobiferus* in great numbers. This river sludge functions as a protective medium into which the larvae burrow; it furnishes material for case making, and serves, also, as a nutrient culture for the rapidly developing blood worms.

Fellton (1940) demonstrated the importance of this type of medium for rapid and vigorous development of *Glyptotendipes lobiferus*. Newly hatched larvae of this species were released in a laboratory culture consisting of washed sand and tap water, to which was added, occasionally, a drop of skim milk. Under the above conditions, *G. lobiferus* larvae required 5 months to develop to the pupal stage. In a second culture containing organic matter taken from the bottom of the heavily polluted lake, plus tap water, and skim milk applications duplicating those added to the first culture, the newly hatched *G. lobiferus* larvae developed to the adult stage in slightly less than two months.

On this basis, the Merrimack River presents conditions favorable for an abundant and rapid propagation of the *G. lobiferus* species. In addition, the heavy pollution (BOD of 10) reduces the dissolved oxygen content to a point where fish—the major predators of midges—cannot exist. Fellton (1941) carried on his experimental work on a brackish lake which showed no tidal activity. He applied orthodichlorobenzene just below the water surface at the rate of 22 gallons per acre. His treatment provided excellent control of midge breeding. However, on the Merrimack River, where a definite tidal action causes exposure of the sludge covered flats for several hours each day, a water emulsion containing .06 per cent pyrethrins was applied directly to the exposed sludge. As a result of this treatment, a high percentage of the blood worms came to the surface of the sludge within 2 minutes, and showed no evidence

of life after approximately 5 minutes of contact with the toxic spray.

#### ECONOMIC SIGNIFICANCE

Although H. K. Townes (1945) in his "Nearctic Species of Tendipedini" states that *Tendipes riparius* and *T. tentans* are the only blood worms which indicate pollution, a series of midge studies conducted along the Illinois River by Richardson (1915-1922) indicated that *T. plumosus* and *T. decorus* both favor heavily polluted waters; Weston and Turner (1917) found *T. decorus* abundant in the effluent stream at the Brockton sewage disposal system; and Fellton (1940) found *Glyptotendipes lobiferus* and *T. stigmaterus* breeding abundantly in a heavily polluted lake located on the Flushing Meadows in New York City. Furthermore, Richardson observed that in the Illinois River, where pollution increased noticeably between 1915 and 1920, *T. plumosus* and *T. decorus* increased 190 fold. In addition, Lindeman (1942) reported that *T. plumosus* and *T. decorus* were quite tolerant of anaerobic conditions. Our experience, and that of Fellton, indicate that *G. lobiferus* reacts to increased pollution in the same manner as *T. plumosus* and *T. decorus*. It is evident that as streams become more heavily polluted, and fish life disappears because of the reduction in the dissolved oxygen content, one may expect an increase in midge breeding.

At Scituate, the midge nuisance is economically important because the major industry of the town is summer recreation; the permanent population being 5,282 (1950 census), while the summer population approaches 25,000. The total valuation of the town is \$14,789,294, about 60 per cent of which represents beach and summer homes. The cost of midge control at Musquashcut Pond averages \$200 per year, or one thousandth of a mill for each \$1.00 of taxable valuation. This small investment shows a fantastic dividend, when balanced against the estimated losses, which might accrue as the result of a continued midge nuisance within the summer colony.

On the Merrimack River, in the vicinity of Merrimacport, phenomenal swarms of *Glyptotendipes lobiferus* during the evening create distracting air vibrations which resembled those emanating from a mowing machine operated at high speed. During the day, these pests accumulated on, or in the immediate vicinity of residences located along the river. Their favorite resting places include screen doors, or window screens, from which position a small percentage of the adults succeed in invading the interior of the homes. In the evening, they are attracted, also, in considerable numbers, to the intensely illuminated refreshment stands located along an important travel route which parallels the river. The midges which emerge from the river flats seem to retain in their tissues some of the waste dyes which have been discharged into the stream by local industrial plants. They retain, also, some of the dried sludge on their appendages. When alighting upon washing, hung out of doors, they leave fine crow's-foot markings on the fabrics. If crushed on wallpaper or upholstery, they produce large unremovable stains. During the summer of 1950,

this midge nuisance became sufficiently serious to warrant an investigation by State authorities. As a result of the investigation, funds were made available for a life history study, and also, for control studies of this pest so closely associated with river pollution.

#### References

- COMMONWEALTH OF MASSACHUSETTS. 1938. Special report of the Department of Public Health and the Department of Public Works in the matter of improving conditions at Musquashcut Pond in the town of Scituate. *House Report No. 264*.
- FELLTON, H. L. 1940. Control of aquatic midges with notes on the biology of certain species. *Jour. Econ. Ent.*, 33(2): 252-64.
- FELLTON, H. L. 1941. The use of chlorinated benzenes for the control of aquatic midges. *Jour. Econ. Ent.*, 34(2):192-194.
- LINDEMAN, R. L. 1942. Seasonal distribution of midge larvae in a senescent lake. *Amer. Midland Nat.*, 27:428-435.
- RICHARDSON, R. E. 1921. Changes in the bottom and shore fauna of the middle Illinois River and its connecting lakes 1913 to 1915 as the result of the increase, southward, of sewage pollution. *Bull. Ill. State Nat. Hist. Sur.*, XIV:4.
- TOWNES, H. K. 1945. Nearctic Species of Tenedipediini. *American Midland Nat.*, 34(1):1-206.

## 1952 CONVENTION

### AMERICAN MOSQUITO CONTROL ASSOCIATION, INC.

One of America's most interesting cities will be the meeting place of the 1952 convention of the American Mosquito Control Association, Inc. The meetings will be held in the Hotel Utah, Salt Lake City, on March 24 to 27, 1952.

All Mosquito Control Agencies are urged to include provisions in their budgets for attendance at this meeting, and make reservations early.

Members of the Utah Mosquito Abatement Association will serve as hosts, and are making special plans for the entertainment of guests, including a tour of the city and vicinity, covering interesting phases of the work of the local Mosquito Abatement Districts, and other points of interest such as Great Salt Lake, the largest open-pit copper mine in the world at Bingham, The State Capitol Building, "This Is the Place" Monument on the site of the entrance of the first pioneer group into the valley, the Temple grounds, and other historic points. Hospitality hour and a banquet will be held in the Hotel Utah.

The Ladies' committee will entertain visiting ladies with a tour of the city, including a special request organ recital in the famed Tabernacle, and a luncheon in the Lion House, the former home of Brigham Young, leader of the first settlers in the valley of the Great Salt Lake.

Every effort will be made by the Utah Association to make this convention a most enjoyable and informative meeting.

The program committee of the A.M.C.A. consists of the Regional Directors, with Dr. C. R. Twinn of Canada as chairman. Plans are being made for an outstanding program. If you have any suggestions, submit them at once to your Regional Director or to Dr. Twinn.

We will see you in Salt Lake City in 1952.