The gynandromorphs were collected from their natural habitat, five by chick-baited lard-can traps and one by a hen-baited trap, and four by CDC miniature light trap. Two of the latter collections were exceptionally large because of dry ice suspended above the trap. These were collected on August 12 at Maggiore Zoo (1 *Culex nigripalpus* gynandromorph of total catch of 2279 mosquitoes) and on September 2 also at Maggiore Zoo (1 *Culex nigripalpus* gynandromorph of total catch of 1206 mosquitoes).

The ratios of affected mosquitoes (data for 1962–64 refer to Taylor *et al.*, 1966) for each species are shown in Table 2.

Seven of the 10 specimens (Table 1) were bipolar with head and thorax—female, abdomen and terminalia—male. These characteristics probably applied to the damaged one also, *Culex nigripalpus* (No. 29). Numbers 1 through 20 were described in the previous gynandromorph paper (1).

The remaining two specimens showed some variation:

Number 24, *Culex nigripalpus,* from a bait trap, had female antennae, female left palpus, atrophied male right palpus, and male abdomen and terminalia.

Number 28, *Culex nigripalpus,* from a light trap, had female antennae, female left palpus, atrophied male right palpus, and male abdomen and terminalia.

All terminalia had rotated in a normal manner.

SUMMARY. During 1965, a total of 296,179 mosquitoes were identified in collections made by power aspirator, bait, and light traps, operating in four counties in the Tampa Bay area of Florida in a program directed by the Encephalitis Research Center at Tampa. Of this total, representing 36 species, 10 were classified as gynandromorphs. All belonged to three species of the subgenus *Culex* (*Culex: nigripalpus, pipiens quinquefasciatus,* and *salinarius.*

Seven of the gynandromorphs clearly showed bi-polar differentiation, with female features anteriorly, and male posteriorly. The remaining two displayed a variation of sexual diversity.

ACKNOWLEDGMENTS. The author expresses appreciation to Doyle J. Taylor, Entomologist, Carl A. Vickery, Jr., Assistant Entomologist, and Karen Webb, Micro-Biologist, of the Encephalitis Research Center.

Literature Cited

TAYLOR, D., MEADOWS, K., and BRANCH, N. 1966. Gynandromorphism in *Culex* (Linnaeus) mosquitoes collected in the Tampa Bay area 1962 through 1964. Mosq. News, Vol. 26, No. 1: 8–10.

LENGTH OF EXPOSURE PERIOD AS A FACTOR INFLUENCING THE EFFECTIVENESS OF LARVICIDES FOR BLACKFLIES (DIPTERA:SIMULIIDAE)[1, 2]

H. JAMNBACK AND R. MEANS

New York State Museum and Science Service

In blackfly larval control programs, streams are treated with insecticides applied over relatively short periods, often less than a minute if applied by aircraft, or over periods of 15 minutes to an hour if dispensed by hand pouring, spraying or mechanical dripping devices (WHO, 1963). It would be of some practical value to know whether the best control with a given amount of insecticide can be achieved by applying it over a short period, resulting in a high concentration for a limited time, or by applying it slowly, resulting in a low concentration over a longer period. However, up to the present time, systematic comparisons of the differences in effectiveness of insecticides applied at different rates have not been described.

This aspect of blackfly larval control was investigated at the New York State Conservation Department Fish Hatchery in Cambridge, N. Y. Tests were carried out in troughs 3 feet long, 1 foot wide, and 6 inches deep, each with an effluent lip 6 inches wide and 4 inches long. When stones with blackfly larvae attached were placed in a trough just above the effluent lip, most of the larvae soon migrated "downstream" to the shallow and rapidly moving water flowing over the lip. Here they could readily be counted before and after treatment and their reactions observed following exposure to insecticides. Details of the procedures used in testing insecticides in these troughs are described elsewhere (Jamnback, 1964; Jamnback & Frempong-Boadu, 1966).

Methoxychlor was used as the test insecticide because it has largely replaced DDT in blackfly control programs in New York State. Tests were carried out using 90 percent methoxychlor dissolved in acetone and alcohol. The amount of water flowing through the troughs was the same in all tests. The apparatus used for dispensing the insecticide in small amounts, at an even rate, over periods ranging up to 12 hours consisted essentially of a disposable 5 cc syringe, a micrometer with the frame removed, and a small electric mo-

[1] Published by permission of the Assistant Commissioner, New York State Museum and Science Service, Jour. Ser. No. 97.

[2] This research was supported by a grant from the World Health Organization.

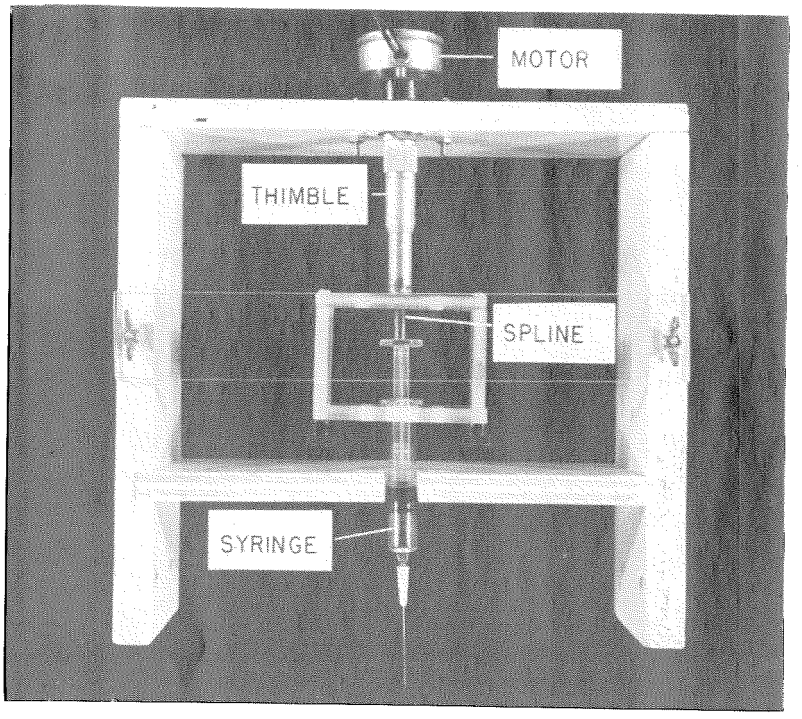

FIG. 1.—Blackfly larvicide microdispenser.

tor with a slowly revolving shaft (Figure 1). These motors are available in a wide range of speeds, from 60 rpm to 1 rpd.[3] The shaft of the motor was fastened to the thimble of the micrometer. As this turned, the micrometer spindle moved down, depressing the plunger of the syringe which in turn dispensed the insecticide through the hypodermic needle beneath the water surface (Figure 1). By selecting motors with the appropriate number of revolutions per minute or per hour, 2 ml of solution could be dispensed over periods ranging from 5 minutes to 12 hours.[4] It was necessary to dilute a stock acetone solution containing 1 percent methoxychlor with alcohol because pure acetone solutions dissolved the adhesive holding the hypodermic needles on the syringes.

Three dispensers were built which emitted 2 ml of toxicant over periods of 10 minutes, 6 hours, and 12 hours respectively. By varying the con-

TABLE 1.—The effect of varying the length of the exposure period, using a constant amount of toxicant[a] and constant flow of water in causing detachment of blackfly larvae.

Length of exposure period	Percentage detached (and number of replicates)[b]
5 minutes[c]	85(5)
10 "	87(5)
15 "	90(8)
20 "	90(5)
25 "	81(5)
3 hours	71(5)
6 "	46(9)
12 "	6(8)

[a] 2.0 mg. of methoxychlor (actual) per replicate.

[b] Mean number larvae per test 48.5 (range 32–50).

[c] In acetone controls, 0.7% of the larvae detached in 28 replicates.

[3] Cramer, permanent magnet, synchronous motors, series 1000, type 1011A, heavy duty, 115 volt, 60 cycle, counterclockwise movement. Giannini Controls Corp., Cramer Division, Old Saybrook, Connecticut.

[4] After the tests were completed, a similar microdispenser was found to be commercially available from C. H. Stoelting Co., 424 N. Homan Ave., Chicago, Illinois.

centration and running sequential or partial treatments, it was possible to run all of the tests shown in table 1 with the three dispensers.

Table 1 summarizes the test results. Exposure periods of 5 to 25 minutes were more effective in causing larval detachment than periods of several hours or more. Exposure periods longer than three hours were progressively less effective so that a dosage that caused 90 percent of the larvae to detach when applied over a period of 15–20 minutes was almost entirely ineffective when applied over a period of 12 hours. These results support the belief of Hocking *et al.* (1949) that "concentration X time = a constant" for short exposure periods at high concentrations, but indicate that this is not the case for longer exposures at low concentrations.

References Cited

HOCKING, B., TWINN, C. R., and MCDUFFIE, W. 1949. A preliminary evaluation of some insecticides against the immature stages of blackflies (Diptera:Simuliidae). Scientific Agric. 29:69–80.

JAMNBACK, H. 1964. Description of a trough testing technique useful in evaluating the effectiveness of chemicals as blackfly larvicides. WHO/VC/96.64: 4 pp.

JAMNBACK, H. and FREMPONG-BOADU, J. 1966. Testing blackfly larvicides in the laboratory and in streams. Bull. Wld. Hlth. Org. 34:405–421.

WHO EXPERT COMMITTEE ON INSECTICIDES. 1963. Recommended methods for vector control. Wld. Hlth. Org. Tech. Rept. Ser. 265:155–227.

ANNOUNCEMENT OF RETIREMENT

Mr. W. C. McDuffie, Chief of the Insects Affecting Man and Animals Research Branch, Agricultural Research Service, U. S. Dept. of Agric. is retiring effective December 30, after over 35 years' Federal service.

Mr. McDuffie began his Federal service with the Cotton Insects Division, Pink Bollworm Investigations, Presidio, Texas, in the summer of 1931, after receiving his B.S. Degree at Mississippi State University that Spring. He worked for the Cereal and Forage Insect Division, and was Station Leader of the Legume Weevil Investigations at Yuma, Arizona, in 1942 when he was transferred to the Insects Affecting Man and Animals Division, New Smyrna Beach, Florida. From 1943 to 1945 he served his country as Lt. and Captain in the U. S. Army Sanitary Corps in Orlando, Fla., Panama and New Guinea. He returned to the Insects Affecting Man and Animals Division after this tour of duty in 1945 at Orlando, Fla., and in 1946, served in Kerrville, Texas and Churchill, Canada, on research on control of ticks affecting livestock and mosquitoes in Arctic areas. In 1948 he returned to Orlando, Fla., where he remained until 1954, advancing from Assistant Station Leader to Station Leader. In 1954 he was transferred to Beltsville as Assistant Branch Chief and was promoted to Branch Chief in 1962. Mr. McDuffie has served the Branch, Division and Department in an outstanding manner.—(From a memorandum by E. F. Knipling dated Nov. 17, 1966.)

Mr. McDuffie has been Associate Editor of Mosquito News (Articles Section) for the past ten years.