HAWK, P. B., OSER, B. L., and SUMMERSON, W. H. 1959. Practical Physiological Chemistry. Blakiston Co. Inc., New York and Toronto.

REEVES, W. C., and HAMMON, W. 1944. Feeding habits of the proven and possible mosquito vectors of western equine and St. Louis encephalitis in the Yakima valley, Washington. Am. Jour. Trop. Med., 94(2):131–134.

REEVES, W. C., TEMPELIS, C. H., BELLAMY, R. E., and LOGY, M. F. 1963. Observation on the feeding habits of *Culex tarsalis* in Kern County, California, using precipitating antisera produced in birds. Am. Jour. Trop. Med. Hyg., 12(6):929–935.

REMPEL, J. G., RIDDELL, W. A., and MCNELLY, E. M. 1946. Multiple feeding habits of Saskatchewan mosquitoes. Can. Jour. Res. E. 24:71–78.

RIDDELL, W. A., REMPEL, J. G., and MCNELLY, E. M. 1947. The specificity of the precipitin reaction as used in the study of mosquito feeding habits. Can. Jour. Res. E., 25:210–215.

SHEMANCHUK, J. A., DOWNE, A. E. R., and BURGESS, L. 1963. Hosts of mosquitoes (Diptera: Culicidae) from irrigated areas of Alberta. Mosq. News, 23(4):336–341.

THOMPSON, E. G., HAYES, P. E., and LUDLAM, K. W. 1963. Notes on the feeding habits of *Aedes sollicitans* in the Chincoteague-Assateague Island area of Virginia. Mosq. News, 23(4):297–298.

WASHINO, R. K., NELSON, R. L., REEVES, W. C., SCRIVANI, R. P., and TEMPELIS, C. H. 1962. Studies on *Culiseta inornata* as a possible vector of encephalitis virus in California. Mosq. News 22(3):268–273.

WEITZ, B. 1952. The antigenicity of sera of man and animals in relation to the preparation of specific precipitating antisera. Jour. Hyg., 50(3): 275–294.

WHITEHEAD, F. E. 1951. Host preferences of *Psorophora confinnis* and *Psorophora discolor*. Jour. Econ. Ent., 44(6):1019.

RELATIONSHIP OF MOSQUITO LIGHT TRAP COLLECTION DATA TO LARVAL SURVEY DATA IN SALT LAKE COUNTY [1]

GLEN C. COLLETT, [2] JAY E. GRAHAM, [3] AND IVER E. BRADLEY [4]

The value and need for making measurements of mosquito populations is generally recognized by mosquito control workers. It is logical to assume that in order to determine the effectiveness of a control program and guide a mosquito abatement operation in both current and long-range planning, it is necessary to carry out a continuous program of measuring the mosquito population.

As early as 1922, Headlee suggested that an "index of potential annoyance" be established and he pointed out that efforts should be made to develop a mechanical substitute for the human collector. Peters, 1956, stated, "The subject 'mosquito measurements' is probably as under-appreciated, I would say, as anything we are doing in mosquito control."

A number of methods are used in making mosquito population studies. Those commonly used by mosquito abatement districts consist of the operation of light traps, biting or body counts, resting station collections, and larval collections. In selecting the method or methods to be used in determining changes in mosquito populations, several factors should be considered. These include the species of mosquito involved, the information desired, and the time that can be devoted to obtaining the desired information.

Light traps have been operated continuously in the Salt Lake City Mosquito Abatement District since 1933 and in the South Salt Lake County Mosquito Abatement District since its organization in 1953. A detailed mosquito larval survey

[1] N.I.H. Grant No. AI-03067-04 TMP.

[2] Manager Salt Lake City Mosquito Abatement District.

[3] Manager South Salt Lake County Mosquito Abatement District.

[4] University of Utah.

was initiated in the county district in 1956 and in 1958 it became a joint project with the city district and has continued to the present. The purpose of this cooperative larval sampling program is to improve the inspection procedures and obtain more accurate quantitative information on mosquito larval populations in these districts. The technique used in carrying out the larval sampling consists of taking quantitative larval samples from each producing pool, as reported by Graham in 1960.

Light traps and the larval sampling have provided valuable information concerning mosquito populations in Salt Lake County. The question to be answered is how accurate is each method for determining population changes in numbers and composition during a season and from year to year. Since larval populations precede the adult populations, a lag should exist between changes in larval and adult populations. Such a lag has been observed and is best shown by comparing the number of pools containing larvae of *Culiseta inornata* with the light trap collections of this species (Figure 1.) This type of relationship is also shown with other species in Salt Lake County, but is not as distinctive as it is in *Culiseta inornata* (Figure 2.)

A comparison of larval data from the South Salt Lake County Mosquito Abatement District with light trap collection data from the Salt Lake City Mosquito Abatement District shows a close relationship (Figure 3.) While problems are different in each district, increases and decreases in mosquito population estimates from the two districts show a marked similarity. Since data are collected independently in each district, this similarity indicates that both light trap collections and larval sampling are valid methods for estimating population changes.

The nature of the mosquito problems in the Salt Lake City Mosquito Abatement District and the South Salt Lake County Mosquito Abatement District is such that larval survey procedures can be more easily

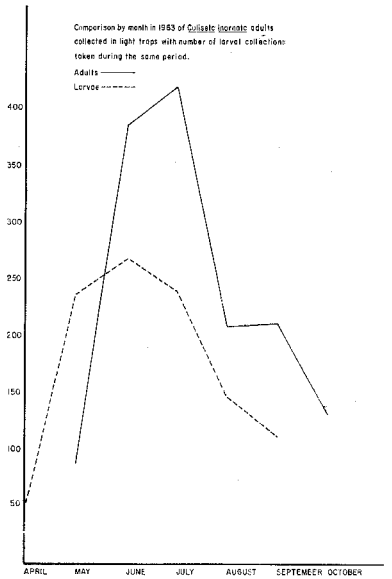

FIG. 1.—Comparison by month in 1963 of *Culiseta inornata* adults collected in light traps with number of larval collections taken during the same period.

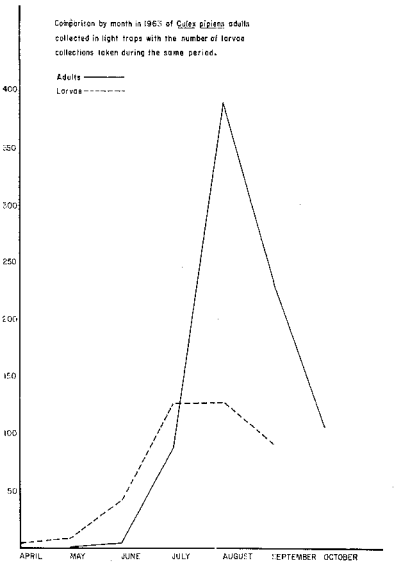

FIG. 2.—Comparison by month in 1963 of *Culex pipiens* adults collected in light traps with the number of larvae collections taken during the same period.

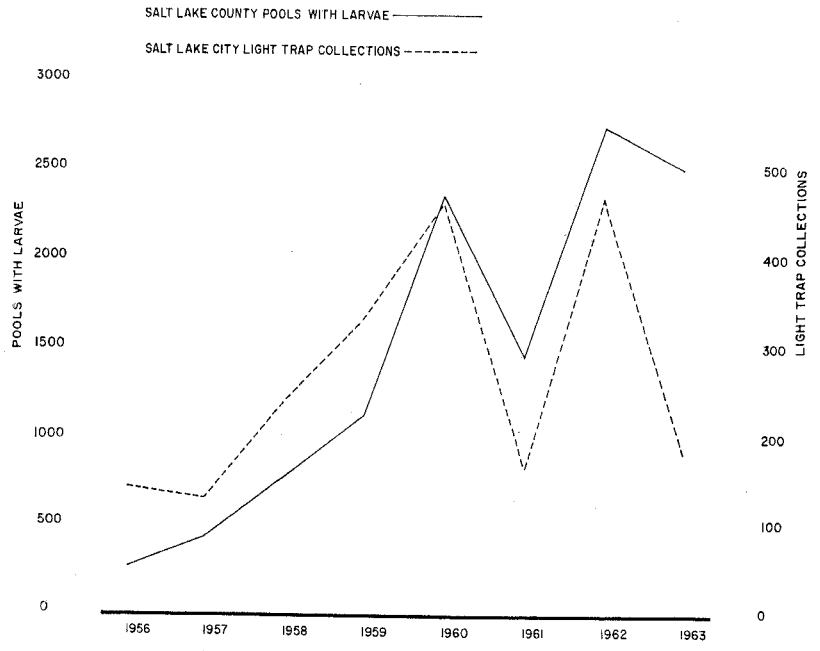

FIG. 3.—A comparison of larval data from the South Salt Lake County Mosquito Abatement District with light trap collection data from the Salt Lake City Mosquito Abatement District.

applied in the county district, and the light trap data in the Salt Lake City District are more reliable. This is possibly explained as a result of the number of traps operated and the experience developed in the placement of traps over a longer period of time in the Salt Lake City District. For a period of several years only three light traps were operated in the South Salt Lake County Mosquito Abatement District. This number of traps did not give an adequate picture of changes in mosquito populations. When additional traps were added in the county, the correlation between larval and light trap data increased. Larval survey data and light trap collection data show a closer relationship for *Culiseta inornata, Culex tarsalis* and *Culex pipiens* than for *Aedes dorsalis.*

For a comparison of light trap and larval survey data, these conclusions are indicated: (1) A positive relationship exists between larval survey data and light trap collections in Salt Lake County. (2) Changes in light trap collections are generally preceded by changes in larval survey data. (3) A closer relationship exists between larval and adult data for *Culex tarsalis, Culex pipiens,* and *Culiseta inornata* than for *Aedes dorsalis.* (4) Additional light traps appear to improve correlation of data between larval survey and light traps. (5) Conclusions reached on mosquito populations are more reliable if both methods are used.

Literature Cited

GRAHAM, J. E. 1959. The relation of detailed larval surveys to control efficiency in Salt Lake County. Proc. 46th Ann. Meet. N. J. Mosq. Exterm. Assn. pp. 119–121.

HEADLEE, T. E. 1922. The problem of evaluating mosquito density and the advantages to be realized from its solution. Proc. 9th Ann. Meet. N. J. Mosq. Exterm. Assn.

PETERS, R. F. 1956. Mosquito measurements —its present strength and shortcomings. Proc. and papers 24th Ann. Conf. Calif. Mosq. Cont. Assn., p. 88.