

distributed into rearing trays, one can use the comparator to determine the number of larvae in several 5-ml. samples of the larval stock and then dispense the larvae volumetrically from the stock into the trays. Uniform dispersion of the larval stock for sampling and distribution can be maintained by aeration, shaking or stirring.

VOLUMETRIC CONCENTRATION METHOD. This method makes use of the tendency of mosquito larvae to swim downward when concentrated in a narrow tube. Larvae from a concentrated larval stock are taken up in a Wintrobe pipet or Pasteur pipet, allowed to concentrate at its tip, and transferred to a hematocrit tube graduated in 0.01 ml. More larvae are added and water is withdrawn as necessary to concentrate the larvae as densely as possible in a pre-selected volume (Figure 2). The number of larvae concentrated in a particular volume tends to be constant for a given person, and thus the number counted can be regulated by adjusting the volume. If the larval stock is maintained evenly dispersed and the volume withdrawn is measured, the per-ml. concentration of larvae in the larval stock can be calculated.

RESULTS AND DISCUSSION. Fifty-five trials of the photographic comparison method were performed by 5 individuals who were asked to estimate 500 1st instar larvae of *A. aegypti*. One-by-one counts of the 55 lots provided an actual average of 563 larvae for an average error of 12.5%. The coefficient of variability among larval counts was 23%, and there was no significant difference among counts made by different individuals ($P > 0.05$, F test).

Fifty-four trials of the volumetric concentration method were performed by 6 individuals to determine the number of 1st instar larvae of *A. aegypti* that could be concentrated in 0.10 ml. of suspension in a hematocrit tube. The average number of larvae concentrated by the 6 individuals varied from 104 to 276 (significant at the 1% level, F test). The coefficient of variability among larval concentrations produced by the same individual was 22%. Thus, the error associated with this method is comparable with that of the photographic comparator method if the average for each person making the counts is determined.

The foregoing degrees of error are regarded as acceptable for routine rearing purposes. In rearing experiments conducted in our laboratory with *A. aegypti*, *Anopheles albimanus* Wiedemann and *An. quadrimaculatus* Say we found that departures from optimal density comparable to the counting error did not result in deleterious undercrowding or overcrowding effects. The varying optimal larval population densities reported by different authors (see Gerberg, 1970) support this conclusion.

The advantages of the photographic comparison method and the volumetric concentration method over those previously available are chiefly practical. Both methods are simple and rapid, and neither requires expensive or hand-crafted equipment.

In addition, both methods are readily adapted to counting different numbers of larvae for different purposes.

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THE CHALLENGE OF COPING WITH MOSQUITO LITERATURE

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The art of coping with literature one wants to see almost daily takes a bit of maneuvering on any researcher's part, especially if one is on a limited budget as most of us are.

The bibliography section of *Mosquito News* entitled "References to Literature on Mosquitoes and Mosquito-Borne Diseases" should save hours of time and money. Over 1200 current journals, books and reports are constantly scanned and checked with the original publications. The bibliography section should take care of most of one's needs. This service is readily available to all purchasers of *Mosquito News*. I have attempted to standardize the abbreviation of the journals cited, and keep the list on Rolodex files. Some foreign journals I purposely do not abbreviate in order to make them easier for the reader to locate.

To my knowledge there is no other bibliography devoted exclusively to mosquitoes and mosquito-borne diseases. But other general bibliographies are on the market and a person may wish to do some scanning for himself. The *Index Medicus* has both subject and author sections. The *Bibliography of Agriculture* has a general subject section plus author and subject indices. Dr. J. L. Houpeau has been making a great contribution for many years through the *Bulletin Analytique*

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d'Entomologie Medicale et Vétérinaire. At present he and J. Mallardeau are the editors.

The last mentioned publication is a monthly and contains numerous references to mosquitoes, usually in one section, but some papers are cited in other sections. For many years, Dr. N. N. Dukhanina published a bibliography relating to many facets of medical entomology in *Medical Parasitology and Parasitic Diseases* entirely in Russian. As she now has other more serious work, S. Losev has become the author of that section. There are numerous references to mosquitoes in it.

Of course, there is *Current Contents*, especially the Life Sciences Section. I admit that this publication and *Index Medicus* are extremely costly but these could be consulted in a good library.

All of these sources and many others except the Russian one are scanned and checked for the bibliography section of *Mosquito News*. I will appreciate receiving reprints of any articles which I may have missed. In addition to complete pagination and volume number, I need the issue number. I do not think that most workers realize how important that little issue number is. Most of us do not have our current periodicals bound and the task of checking sometimes as many as 52 issues to find the one desired, can be frustrating. The issue number also helps librarians to get the material more quickly.

I have developed a system to save time and energy when assembling a bibliography. References are hard to check and keep accurate, and a minimum amount of copying prevents mistakes.

A large bibliography can be typed on cards in any style preferred. The format used in the bibliography section of *Mosquito News* may be adapted to one's needs. An 8 x 10 heavy white bond paper may be used and about 10 slits made down the page. The slits should be just the size to hold a 3 x 5 card tightly and the sides should be anchored by press-on white correction tape (about 1/2 in. in width) to keep them intact. Of course, larger cards may be used. Once the cards are in place (Figure 1), the sheet is slipped inside a clear plastic folder. They are then ready for photocopy. As a result, a neat page of 4 to 7 references is produced with little effort. Even the pages may be prenumbered and arranged in order as in a manuscript. The sheets should last for at least 25 bibliographies if handled with care. This system eliminates the typing of a bibliography and proofreading—both time consuming jobs. The method is used for the bibliography section of *Mosquito News* and as far as I am aware, the printers have no objection. It should be much easier for the typesetter.

One interesting approach for solving the problem of obtaining copies of articles one desires, is the establishment of the Museum of Literature on Mosquitoes and Mosquito-Borne Diseases by Dr. Z. H. Husainy in India. His proposal is an informal cooperative effort of authors, govern-

ments, private agencies, scientific societies and libraries. Authors are asked to donate one reprint each of all their papers as well as books and monographs. The object is to collect as many reprints as possible on this subject from all parts of the world. He has asked me to publicize this project so that many workers will contribute their reprints. This is a voluntary system on the part of the authors in helping to build the museum stock pile. Publications received will be entered in registers and stored for future use. The most important service of the museum will be the photo-duplication of copies supplied for a nominal cost. He feels that such a museum could provide research papers to culicidologists, malariologists, virologists and others who need the articles but are unable to obtain them. No single library can do this at present, but he feels that the museum, will—in time—be able to provide this service. For anyone interested in this project, Dr. Husainy's address is as follows: Dr. Z. Husainy Husainy, Assistant Entomologist, Hakim Bhajji House, 13 Hakim Bhajji Bhai Street, Khandwa, M. P., India.

But suppose nothing turns up from the sources I have mentioned and one needs to know what the article contains. The *Review of Applied Entomology Ser. B* abstracts a number of Eastern European and Asiatic journals. The *Tropical Diseases Bulletin* of London has a wide range of African and Asian reviews or abstracts. *Entomology Abstracts* covers some difficult-to-get articles, *Biological Abstracts* takes in foreign literature; *Pesticides Abstracts* gets a number of abstracts of interest to mosquito workers, and a Russian journal, *Referativnyi Zhurnal* abstracts papers from many parts of the globe. The last mentioned is in Russian but it could be translated. This journal regularly abstracts articles from *Mosquito News* into Russian.

These abstracting journals are most helpful. But with all such journals, there has to be a time lag.

I assume that most are familiar with the Annual Mosquito Reviews started by Dr. L. O. Howard over 50 years ago. These have been authored since then by Dr. F. C. Bishopp and associates, and now have been inherited by me. There is a two-year lag on these annual reviews which have a different title each year, and are published as a Supplement to the New Jersey Mosquito Control Association Proceedings. These annual Mosquito Reviews were part of the Proceedings of that Association for over 45 years but now as a Supplement, they are sold separately. The Annual Reviews contain abstracts and reviews of a very select group of papers which I think are the most important or interesting over the world in any particular year. The subject matter covered is as follows: an introduction; sections on taxonomy and distribution; techniques; genetics and genetic control; behavior, biology and ecology; anatomy, morphology and physiology; arboviruses; filariasis; malaria; adulticides and larvicides; parasites and predators; resistance and sus-

GENETICS AND GENETIC CONTROL

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Mahon, R. J., Green, G. A. and Hunt, B. H. 1976. Diagnostic allozymes for routine identification of adults of the Anopheles gambiae complex (Diptera, Culicidae). Bull. Ent. Res. 66(1):25-31.

Oda, T. and Kuhlow, F. 1976. Gonotrophic dissociation in Culex pipiens pipiens L. Tropenmed. u. Parasitol. 27(1):101-105. In Ger., Engl. Sum.

Sharma, V. P. 1976. Elimination of aziridine residues from chemosterilised mosquitoes. Nature (London) 261(5556):135.

ceptibility; and attractants and repellents. As far as I know, this is the only annual review devoted exclusively to mosquitoes, and the price has been kept low so that most can afford it.

I have not mentioned computer searches avail-

able in some libraires, colleges and commercial companies because most of these are too costly for the average person even to think about. With the tools which I have mentioned, one should be able to obtain the publications one needs.

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NEW DISTRIBUTION RECORDS FOR
LUTZOMYIA GOMEZI (NITZULESCU)
AND *L. CHIAPANENSIS* (DAMPF)
FROM HONDURAS

R. W. INTERMILL¹ AND W. B. MULLER²

The general distribution and identification of Phlebotomines in Central America is not well documented. However, exhaustive collections of sand flies from Panama have revealed some 67 species (Christensen 1972). Knowledge of sand flies occurring in Honduras, C.A. is provided from collections by Gorgas Memorial Laboratory personnel who identified 17 species in 1953-1954 (Fairchild and Hertig 1959). During a visit to Honduras in July of 1975, several species of sand flies were collected. Two of these species, *Lutzomyia gomezi* and *L. chiapanensis*, had not been previously recorded from Honduras and constitute new distribution records.

The first record of *L. gomezi* in Central America was from Panama (Fairchild and Hertig 1948), and this anthrophilic species is considered a potential vector of *Leishmania braziliensis* (Lainson and Shaw 1972). This species has also been reported from El Salvador (Rosabal and Trejos 1964), Nicaragua (Fairchild and Hertig 1959), and Costa Rica (Rosabal 1954). Therefore, this record from Honduras is not surprising. *Lutzomyia chiapanensis* was first described from Mexico by Dampf (1947). Fairchild and Hertig (1948) characterized this species from Panama one year later. Collections by Trapido and Galindo in 1953 from La Libertad, resulted in distribution records for this species from El Salvador (Fairchild and Hertig 1957). Rosabal (1954) reported *L. chiapanensis* from Barranca, Costa Rica from collections by H. W. Kumm. Although it is presumed to be an anthrophilic species (Dampf 1947), its importance as a vector of disease is unknown.

A single *L. gomezi* was aspirated from a burro in Yuscaran, a village of 1500 inhabitants, located approximately 60 kilometers east of the capital city, Tegucigalpa. Two specimens of *L. chiapanensis* were collected by CDC light trap in the small village of El Tenideros, located approximately 10 kilometers from Yuscaran. Identifica-

tions of both species were made by Mr. David G. Young, Department of Entomology and Nematology, University of Florida, Gainesville, Florida.

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