REVIEWS AND ABSTRACTS

THE JOINT ACTION OF DDT AND ETHYL ALCOHOL UPON ANOPHELINE LARVAE IN BIOASSAY SUSPENSIONS. By W. B. Hawkins, J. Econ. Ent. 49(4):433–435. 1956. 2 graphs, 2 refs. The toxicity of DDT dispersed in colloidal suspensions by the replacement of solvent method is correlated with the concentration of the initial DDT solvent in the suspension. The LD_{50} of *Anopheles quadrimaculatus* larvae in DDT suspensions containing 1.0, 0.1 and 0.01% ethyl alcohol increases by a factor of two with each tenfold decrease in alcohol concentration. However, there is no parallel increase in the LD_{99} when the percentage of alcohol decreases from 1.0 to 0.1, but the LD_{99} is doubled when the alcohol is further lowered to 0.01%. Test suspensions were prepared by dilution of aliquots of an initial suspension so that the alcohol concentration decreased parallel to the DDT concentration. As before, larval kill decreased with each lowering of the alcohol concentration, but to a greater degree, indicating the influence of other, but unknown factors. The toxic action of DDT is increased by conditioning the larvae in 2% alcohol solution prior to placing the larvae in DDT suspensions containing small amounts of alcohol. The results emphasize the necessity for studying this joint action of solvent and toxicant if with mosquito larvae more quantitative bioassay results are to be obtained.—Author's summary.

NOTES ON MICROCLIMATE AT THE SITES OF BREEDING AND BITING OF *Aedes* SPECIES (DIPTERA CULICIDAE) ON UKARA ISLAND, TANGANYIKA. By A. Smith. Proc. R. Ent. Soc. Lond., (A) 31(4–6):81–85. 1956. (1) Reflected light from a rock pool with *Aedes vittatus* larvae was of the order of 60 F. C. compared with 2 F. C. above a pool in a rot hole with larvae of *Ae. africanus, Ae. aegypti,* and *Ae. apicoargenteus* during the brightest parts of the day. Temperature varied 4.5° C. in the rock pool compared with 1° C. in a rot hole in a mango tree and 2° C. in a rot hole in a pollard. (2) Larger numbers of *Aedes* were caught on banana bait near foliage with a dark interior (2 F. C.) than near foliage with brighter interiors (20 F. C.) (3) Observations were made to study the biting activities of *Aedes* species in different natural surroundings. It was concluded that any advantageous differences of temperature, humidity or light at the position of the mosquito catchers were masked during daylight hours by the presence nearby of suitable thicket, which is a resting place for *Aedes.*—Author's summary.

(Note: Ukara Island is situated in Lake Victoria.)

THE ISOLATION OF ILHÉUS VIRUS FROM WILD CAUGHT FOREST MOSQUITOES IN TRINIDAD. By C. R. Anderson, T. H. G. Aitken, and W. G. Downs. Amer. J. trop. Med. Hyg. 5(4):621–625. 1956. 2 tables, 5 refs. Two strains of virus isolated in 1954 from forest mosquitoes in Trinidad, B.W.I., have been shown by reciprocal cross-neutralization tests to be strains of Ilhéus virus. Both strains produce a hemagglutinating antigen, similar in reactivity to the antigen produced from the known Ilhéus strain. These isolations represent the second and third times the virus has been found in nature.

Since submitting this paper for publication, four more Ilhéus virus isolations from Trinidad mosquitoes have been made by the laboratory. All isolations were made in 2-day-old mice inoculated with mosquitoes caught in the Rio Grande Forest about 8 miles northeast of Sangre Grande. Strain one (TRVL, specimen No. 10507) came from a mixed pool of 105 mosquitoes (21 species in 9 genera) collected December 16, 1955; strain two (TRVL, specimen No. 10554) came from a mixed pool of 233 mosquitoes (17 species in 8 genera) collected December 23, 1955; strain three (TRVL, specimen No. 10584) came from a mixed pool of 103 mosquitoes (13 species in 7 genera) collected January 3, 1956; and the fourth strain (TRVL, specimen No. 10654) was isolated from a pool of 7 *Psorophora ferox* collected January 10, 1956. All of the mixed pools contained reasonably large numbers of *Aedes* and *Psorophora* species except No. 10584 which had 30 *Aedes* (*serratus*) and only one *Psorophora* (*lutzi*).—Authors' summary and addendum.

NOTES ON *Anopheles marteri* SENEVET AND PRUNNELLE, 1927. By E. R. Shahgudian. Proc. R. Ent. Soc. Lond. (A) 31(4–6):71–75. 1955. 34 refs. 2 figs. (1) The examination and comparison of the larvae of *Anopheles marteri* Sen. & Prun. from Algeria with larvae of *A. marteri* var. *conquensis* from Spain has revealed no differences. The original descriptions of adults of *A. marteri* var. *conquensis* Torres Cañamares apply equally well to *A. marteri* from Algeria. There appears no necessity therefore to distinguish these forms on morphological grounds and it is proposed that the varietal name be sunk as a synonym.

(2) Larvae of *A. marteri* from Algeria, Tunisia, Spain, Transjordan, and Palestine are characterized by having shorter posterior clypeal hairs than those from Sardinia, Greece, Tadjikistan and Iran, and it is proposed that the first group should be regarded as typical of the species described by Senevet and Prunnelle and should retain the name *Anopheles marteri* subspecies *marteri.*

The forms occurring in the second group of countries are more nearly related to that described by Keshish'yan as *Anopheles sogdianus,*

and it is proposed that this group should therefore be named *Anopheles marteri* subspecies *sogdianus*.

(3) No constant morphological differences could be detected in other stages of these anophelines.—Author's conclusions.

MALARIA MANUAL FOR U. S. TECHNICAL COOPERATION PROGRAMS. Compiled by the Div. International Health, Public Health Service, Dept. Health, Education, and Welfare, Washington 25, D. C. Public Hlth. Tech. Ser. Manual I. Jan. 1956. 199 pp. This is the official basic malaria technical policy document of the International Cooperation Administration. The Manual is composed of 7 chapters and 18 attachments. In the Introduction are noted the incidence of malaria and its geographical distribution, the agencies of the world and of the United States which have been working on eradication and control, and the present status of the malaria and mosquito programs. At least 7 species of anophelines (*Anopheles gambiae, A. maculipennis, A. quadrimaculatus, A. sacharovi, A. stephensi, A. sundaicus,* and *A. superpictus*) "have been reported to have developed a physiological resistance to one or more of the chlorinated hydrocarbons."

Chapter II, 7 pages, summarizes: "A. Over-all Policy; B. Program Plans Review"; and "C. Relationship to Malaria Assistance by Other Agencies." Under "C" are discussed briefly ICA, WHO, and UNICEF, the principal agencies assisting national governments with malaria control or eradication programs.

"Operations," is the heading of the third chapter, which covers 21 pages. Subhead "A" includes: "1. Malariometric Surveys; 2. Entomologic Surveys"; and "3. Economic Surveys." Subhead "B" is "Planning of Operation Program," and it includes: "1. Insecticides; 2. Equipment; 3. Chemotherapy"; and 4. "Personnel." Under "1" is discussed the use of the insecticides, DDT and dieldrin, with dosages and preparations of the mixtures given in detail. Under "3" are listed the drugs, Pyrimethamins, Chloroquin, Primaquine, Proguanil, and Mepacrine, with schedules for suppressive and therapeutic treatments.

Chapter IV, "Research," occupies 2 pages; V, "Reporting," and VI, "Evaluation," are one page each; and VII, which is a list of the attachments, is 1½ pages. The 18 attachments, or appendices, occupy 160 pages, or ¾ of the entire Manual. These attachments include minutes of meetings; statements and policies set forth by committees and key organizations; specifications for recommended insecticides and a compression sprayer; examples of surveys and of forms to be used for various reports; an article by Dr. Fred L. Soper on, "Hemisphere-Wide Malaria Eradication," and one by Dr. G. Robert Coatney on, "The Present Status of the Anti-Malarial Drugs Chloroquine, Pyrimethamine (Daraprim), and Primaquine." The eighteenth attachment is a brief bibliography of suggested publications for malaria reference libraries.

Acknowledgment for assistance in preparation and review of the manuscript is given to Doctors Justin M. Andrews, George H. Bradley, G. Robert Coatney, Willard H. Wright, and Professor Everett D. Hawkins.

Although distribution of this Manual up to September was limited primarily to ICA field health staffs, a recent re-run has made available a few copies for qualified persons; and it is urged that only those interested in *international* malaria programs request copies. Those who do have this book on their shelves, will have access to a brief but well-written, clearly printed, authoritative document. Address Public Health Division, ICA, Washington 25, D. C.—H.L.T.D.

TRANSMISSION OF EASTERN EQUINE ENCEPHALITIS TO HORSES BY *Aedes sollicitans* MOSQUITOES. By W. D. Sudia, D. D. Stamm, R. W. Chamberlain, and R. E. Kissling. Amer. J. Trop. Med. Hyg. 5(5):802–808. 1956. 7 refs. *Aedes sollicitans* mosquitoes became infected with Eastern equine encephalitis (EEE) from feeding upon an inoculated horse. These mosquitoes, after 2 weeks' incubation, transmitted infection by bite to a normal horse. Attempts to infect more mosquitoes by permitting them to feed upon this second horse met with failure. The virus which circulated in the blood of the inoculated horse titered as high as $10^{-5.5}$, a level not commonly attained in horses. The horse infected by mosquito bite had a lower, more usual concentration of virus in the blood, inadequate to infect mosquitoes. The results of these studies prove it possible for an occasional horse to serve as an EEE infection source for mosquitoes. It is believed, however, that horses rarely play an important role in EEE propagation.—Authors' summary.

SELECTION OF LARVAE OF *Anopheles quadrimaculatus* FOR TOLERANCE TO DDT. By W. B. Hawkins. J. Econ. Ent. 49(4):567–569. 1956. 2 graphs, 3 refs. The dosage mortality data for the larvae of the Beaver Dam colony are plotted in Figure 1. It will be noted that there is some variation among the series of tests. The LD_{50}'s range from 0.0025 to 0.0038, while the LD_{60}'s range from 0.007 to 0.015 p.p.m. Except for the larvae of the F_1 generation of the BDR colony, those of the later generations show some increased tolerance of DDT (Fig. 2). A comparison of the data for the larvae of the BD colony and those of the F_8 generation of the BDR colony shows that 5 successive selections with DDT have increased the LD_{50} from 0.0025 to 0.0038 p.p.m. DDT to about 0.0076 p.p.m. DDT. By the same comparison the LD_{90} has increased from 0.007 to 0.015 p.p.m. DDT to about 0.025 p.p.m. DDT.

These increases in LD_{50}'s and LD_{90}'s of the BDR larvae have resulted not from a shifting of the curves throughout their length, but roughly

from a rotation about the 100 percent kill point such that the slopes of the curves have been increased. According to Hoskins and Gordon (1956) such increases in slope may only denote a greater vigor among the survivors of a selection. They also suggest that a population which responds to selection as have these *A. quadrimaculatus* probably lacks factors necessary for the development of true resistance. Thus, though conclusions must be drawn with restraint because of the small number of selective exposures, the data suggest that *A. quadrimaculatus* may be incapable of developing resistance to DDT.—Author's discussion.

(Note: Larvae taken from Beaver Dam, Kentucky, and maintained in the insectary at Wilson Dam, Alabama, are designated as the BD colony. The BDR colony is the one established by successive exposure of the larvae to DDT.)

THE VALUE OF MAXILLARY INDEX IN THE IDENTIFICATION OF MOSQUITO RACES. By M. A. R. Ansari and A. S. Nasir. Pakistan J. Health V(1):37–43. 1955. 16 refs., 3 figs. Some reliable information from elsewhere has been recently accumulated suggesting that behaviour of some anopheline mosquitoes considerably changes from place to place. A species notorious for its nefarious activities as a malaria vector at one place may be found innocent at another. The 2 forms showing different trophic responses exhibit no superficial morphological differences. A criterion to isolate these races has been felt a dire necessity and is partially found out.

Roubaud (1931) drew the attention of biologists to the importance of maxillary index in *Anopheles*. Trensz (1930) defined the maxillary index as the mean of the number of serrations in the female maxilla. Senior White (1937) stated that an increase in the number of maxillary teeth indicated zoophilism in mosquitoes. Races feeding constantly on domestic animals average 14–15 teeth, while those feeding on human blood have an index of 14 or less. Holstein (1954) applied this criterion to *A. gambiae* and was able to split this species into 2 distinct races. Campbell (1951) also had split *gambiae* into 2 groups on the same basis.

We studied the maxillary index of a random sample of *A. culicifacies* caught from villages around Lahore. The mean maxillary index was found to be 12.32. According to Holstein (loc. cit.), this collection is referable to paucidentate or anthropophilic group. The acid test to this conclusion is the precipitin test. Unfortunately we lack facilities for such a test; however, we have preserved the blood meals on filter papers and shall record the precipitin test when opportunity is available.—Adapted from authors' summary.

LA ERRADICACION DEL *Aedes aegypti* EN LAS AMERICAS. By O. P. Severo. Bol. Of. San. Pan 40(6):485–498. 1956. 4 figs., 14 refs. The first part of this paper presents a brief review of the measures developed to control the insect vectors of yellow fever and malaria, starting at the turn of the century with the confirmation of Finlay's theory on the role of the *Aedes aegypti* in yellow fever transmission and the definition by Ross and Grassi of the *Anopheles* role as malaria vector. Reference is made to the early campaigns by Gorgas in Havana and Oswaldo Cruz in Rio de Janeiro to combat these two mosquitoes by fumigation for the alate stage and mineral oil for the larval stage, together with the protection or destruction of containers. An account is given of how the control measures used also in other large port cities brought about the apparent disappearance of the disease in almost the entire Continent by 1908. Mention is made of what was done in the interval before yellow fever reappeared in Rio de Janeiro in 1928, when attention was drawn to certain epidemiological aspects of the disease leading Soper, in 1932 to the discovery of the sylvatic aspect of yellow fever, and showing that the solution of the problem lay in the eradication of the *Aedes aegypti*. It was demonstrated, in campaigns conducted in several South American countries under the auspices of the Rockefeller Foundation that eradication was possible with the use of technical and administrative measures based on systematic inspection of dwellings and compulsory application of petroleum to containers with foci.

Reference is made to the decisive phase of *Aedes aegypti* eradication in the Americas, which began with the advent of DDT and the turning over of responsibility for the problem to the Pan-American Sanitary Bureau in 1947.

A description is given of how the campaign was extended to almost all the countries and territories, with the aid and collaboration of the Bureau and contributions from TA/WHO, UNICEF, and IIAA. Stress is laid on the value of the technical standards adopted, which are based on the application of DDT by the perifocal method, and how these standards permitted the establishment of a criterion for proving eradication based on the residual action of DDT and on the biology of the *Aedes aegypti*, together with a periodic evaluation made of the results, the latter being considered generally, very satisfactory.

The second part of the paper comprises a summary of the progress of the campaign, describing the results obtained in the various countries and territories, as depicted in the map showing the areas considered to be free as well as those still infested. Also included is a table presenting the statistical data that served as the basis for the evaluation, together with two bar charts showing the development of the eradication campaign from 1948 to 1955 in the various countries and territories.—Author's summary.

RESIDUAL INSECTICIDAL SPRAYING IN SHEIKUPURA DISTRICT OF THE PUNJAB FROM 1951–1954 AND ITS RESULTS. Raft, S. M. and Rashid, A. Pakistan J. Health 5(2):88–95. 1 ref., 6 graphs,

5 tables. July 1955. The insecticidal spraying for 1951–1954 in the villages of Sheikhupura, one of the economically important districts of the Punjab, is discussed in this article. A spleen and parasite rate was determined for children between the ages of 2–10 years, before the start of operations in 1951; the spleen rate was 51.2 percent and the parasite rate was 43.4 percent.

Wettable DDT was prepared in the proportion of 1 lb. of DDT to 1 gallon of water, and 1 gallon was sprayed on 1,000 feet of surface with a deposit of 200 mgm. of DDT per square foot. The villages sprayed for the first time each year were given 200 mgm. per square foot, while those which were sprayed during the previous year were painted with 100 mgm. per square foot.

The tables and graphs indicate a gradual decrease in the spleen and parasite rate in sprayed villages, with a steady rise in the rates in the control areas. According to the figures, also, there was a decrease in the average number of fever cases as ascertained from door-to-door visits during November and December of each year. The number of cases ranged from 0.5 to 8.3 in the sprayed villages, and from 15.4 to 41.9 in the unsprayed villages. Blood films collected from infants born after the malaria transmission season indicate that malaria transmission was nil in the sprayed area, and ranged from 5.0 to 22.0 in the unsprayed area. There was also a marked decrease in the numbers of adult mosquitoes taken—0.9 to 2.5 in the sprayed area, and 3.1 to 13.3 in the unsprayed. *Anopheles* larvae per dip averaged from 1.0 to 3.5 in the sprayed villages, and 6.0 to 27.0 in the unsprayed ones.—H. L. T. D.

MOSQUITO CULTURE TECHNIQUES AND EXPERIMENTAL PROCEDURES. Helen Louise Trembley Durkee, Amer. Mosq. Control Assoc. Bull. No. 3:1–73, many refs. 1955. Helen Louise Trembley Durkee has condensed into most readable form an immense amount of information regarding the laboratory rearing of mosquitoes and safe techniques to use in handling them as vectors of disease. Based on her own years of experience in raising mosquitoes at the U. S. Department of Agriculture and the National Institutes of Health, her contacts with fellow researchers throughout the world, and a careful evaluation of the literature, she has written this excellent guide which should be of value to mosquito workers everywhere.

The main part of the Bulletin is 22 pages long, of which 13 pages are devoted to "Rearing," 6 pages to "Development and Behavior," 2 pages to "Disease Transmission," and 1 page to "Precautions." This is followed by a fine "Literature" section, 26 pages long, divided into four sections: Rearing, Development and Behavior, Disease Transmission, and General Reference Works, much of which is actually an annotated bibliography or a series of abstracts written by fellow research workers. There are abstracts here, for example, by Brookman and Reeves on the insectary rearing of *Culex tarsalis* and *stigmatosoma*, or by Chamberlain on *Culiseta melanura*. Finally there is a series of 17 figures or photographs showing model insectaries (with the author), rearing equipment, animal feeding cages, and various phases of laboratory work.

The main section devoted to "Rearing" gives detailed information about the raising of ten of the most commonly reared mosquitoes: *Anopheles quadrimaculatus, A. freeborni, A. aztecus, A. albimanus, A. stephensi, Aedes aegypti, Ae. albopictus, Ae. atropalpus, Culex pipiens,* and *Culex quinquefasciatus*. Here the reader will be impressed by her ability to discuss mosquito culture techniques in a most understandable and interesting manner and to make a critical evaluation of the numerous methods of raising mosquitoes recorded in the literature based on her own years of laboratory experience.

Many of the students from other countries who have studied at the Communicable Disease Center have expressed their appreciation of the clear style and wording and the excellent photographs in this fine bulletin. Since "Mosquito News" reaches so many workers outside the United States, either through subscriptions or the Good Neighbor Club of the American Mosquito Control Association, authors of future AMCA Bulletins should consider these aspects of publication which Helen Louise Trembley Durkee has achieved so very well.—Harry D. Pratt, Communicable Disease Center, Atlanta, Georgia.

PLEASE CORRECT

The cover of your copy of *Mosquito News* for September reads "Volume 16 . . . Number 2." It should read "Volume 16 . . . Number 3." We suggest you make this correction for convenience in future reference.