

REVIEWS AND ABSTRACTS

MOSQUITOES. THEIR BIONOMICS AND RELATION TO DISEASE. By William R. Horsfall. viii+723 pp. Ronald Press Co., New York 10, 1955. Price \$16.00. Dr. Horsfall, who has previously made a number of valuable contributions to our knowledge of mosquitoes, has now produced a monumental piece of work summarizing the bionomics and disease relationships of the mosquitoes of the world. The author's index indicates that 2,079 species or subspecies are referred to in the text.

The subfamily Culicinae is first discussed in a general way, bringing out important facts on distribution, habits and physiology applicable to the whole group. Parasites and predators attacking mosquitoes are tabulated. A table is also presented listing the species of mosquitoes that are reported to show resistance to various insecticides, where this occurs and by whom reported. Relations of mosquitoes to various virus diseases including yellow fever, dengue, and encephalitis are also given in tabular form.

More detailed information is then presented by genus and species following the same plan used in the subfamily discussion. Especially useful are the tables showing relation between the mosquito species and *Plasmodia*, local larval distribution, and host relations of the more important species. The summary statements on the breeding, flight and other habits, and the seasonal history, longevity and toxinosity, arranged by species, makes readily available much information in concise form.

Obviously little information is published on many of the species listed but the author has done a remarkable job in assembling the major part of that which is available. Work on species that have been thoroughly studied, and these are mainly the ones of greatest economic importance, is well reviewed. The extent of this review is indicated by the bibliographical references which total 4215.

In an appendix are given citations to techniques used by various workers and a glossary of technical terms.

Although rather expensive, this book is so useful to people conducting research on mosquitoes in any part of the world that they can not well be without it. It should also prove valuable as a reference work in libraries of large mosquito control organizations.—F. C. Bishop, P.O. Box 1033, Brownsville, Texas.

THE BLACK FLIES (DIPTERA, SIMULIIDAE) OF GUATEMALA AND THEIR ROLE AS VECTORS OF ONCHOCERCIASIS. By Herbert T. Dalmat. Smithsonian Miscellaneous Collections 125(1):vii-425 pp., 44 pls., 36 tables, 21 figs., 15 maps. Published by the Smithsonian Institution (Publication 4173), April 5, 1955. Onchocerciasis, a disease

which is transmitted by blackflies, is of considerable economic importance in Guatemala. It is endemic along the western foothills of the Sierra Madre Mountains in an area of about 500 square miles, and in two smaller areas, aggregating about 85 square miles, near the Mexican border. In the endemic zones, about 35 per cent of the population is infected. Ocular involvement is manifest in more than half of the persons infected, and blindness occurs in approximately 5 per cent.

A large number of factors—economic, social, topographical, climatological, and entomological—influence the distribution and prevalence of the disease. In the first part of this volume, the epidemiology of onchocerciasis is discussed in a search for the explanation of its limited distribution in Guatemala. The geography, climate, customs and occupations of the inhabitants, plant and animal associations (with particular reference to *Simulium* species), and the types of streams inside and outside of the endemic areas are considered.

When this study was initiated the taxonomy of the Guatemalan species was incompletely known. Certain species of *Simulium* had been incriminated as vectors of onchocerciasis in Guatemala, but many details of their life history and ecology were lacking. One of the important phases of Dr. Dalmat's investigation was the collection and classification of species of blackflies occurring in Guatemala. Ten new records and 13 new species were reported by the author in the course of this study. Complete descriptions and keys to genera, subgenera, and species of males, females, pupae, and larvae of the Guatemalan species are given.

Only 6 of the 41 species of blackflies found in Guatemala commonly bite man, the others being almost entirely zoophilic. In the principal onchocerciasis zone, the three important anthropophilic species are *Simulium ochraceum*, *S. metallicum* and *S. callidum*. An excellent account of the life histories of these species is given along with less detailed life histories of some of the other species.

Studies of the biting habits, flight range, longevity (of both infected and non-infected flies), resting places and heights at which the adults occur were made. Attempts to establish a laboratory colony of blackflies, although unsuccessful, were ingeniously contrived and provide some very interesting information. There is a section dealing with the factors influencing the distribution of the immature stages in streams. Altitude, stream temperature, pH, size of the stream and rate of flow along with other factors are considered in relation to stream types and to species of blackflies occurring in the streams.

The seasonal population fluctuations of the different stages of the principal anthropophilic

species are discussed in relation to the timing of control measures for optimum effectiveness.

At the end of the book there is a section entitled "Transmission of Human Onchocerciasis in Guatemala," in which the author discusses onchocerciasis in Guatemala and how its distribution is affected by the habits and habitat preferences of the blackflies which transmit the disease.

This study by Dr. Dalmat is an outstanding contribution to our knowledge of Guatemalan blackflies in relation to onchocerciasis.—H. Jambnack.

THE MECHANISM OF FOOD DISTRIBUTION TO MIDGUT OR DIVERTICULA IN THE MOSQUITO. M. F. Day. Australian J. Biol. Sci. 7(4):515-524. 1954. This paper is concerned with explaining what factors permit adult *Aedes* mosquitoes to shunt blood into the midgut and sugar solutions into the ventral diverticulatum (crop) as described by Fisk, Trembley, and others. When both blood and sugar are imbibed by mosquitoes the mixture goes to both midgut and diverticulum. The *Aedes* female is able to detect 1 part blood in 20 of glucose. Although *Aedes* detect sucrose, arabinose, mannose, and raffinose, they are apparently unable to detect lactose.

The author describes and figures four types of papillar sense organs within the "buccal" cavity: (a) three pairs of "palatal" spines, (b) a dorsal papillar sense organ, (c) three dorsal pairs of hair-like receptors, and (d) a single pair of campaniform papillae. While all seven pairs of sense organs receive nerves from the frontal ganglion, the precise method of their innervation was not traced. Innervation of the diverticula via the stomatogastric nerves is diagrammatically illustrated.

The following hypothesis is suggested: "certain sugars stimulate the pit organs in the buccal cavity . . . causing impulses that result in the relaxation of the sphincters of the diverticula. Certain components of the blood of vertebrates stimulate the papillae sense organs, resulting in relaxation of the cardiac sphincters. Simultaneous stimulation of both groups of sense organs may result in relaxation of both series of sphincters." (p. 522.)

This hypothesis seems to be a very reasonable one. It would be extremely interesting to test its validity by ablation or stimulation of the frontal ganglion under different conditions. Presumably the frontal ganglion is the principal relay station for the switching mechanism. Before such experiments could be performed one would need much more detailed anatomical information.—Jack Colvard Jones, National Institutes of Health, Bethesda 14, Md.

NEW DATA ON THE PHYSIOLOGY AND ANATOMY OF THE DIPTERAN HEART (STRUCTURE AND FUNCTIONS OF THE HEART OF *Anopheles maculipennis* MGN.). By L. V. Iaguzhinskaia. Bull. M. Ø-VA Isp. Priordy, Otd. Biol. 59 (1):41-50. 1954. (In Russian.) This paper briefly describes

the anatomy of the abdominal part of the heart in adult *Anopheles maculipennis* after staining whole mounts with methylene blue. It refers to the spiral musculature of the heart tube, to ostia, alary fibrils, large pericardial cells, and to the ventral diaphragm. Although able, like the reviewer, to find segmental innervation of the alary fibrils, the author could not trace the nerve further and writes ". . . we did not find any nerve cells connected with the innervation of the heart" in the mosquito (p. 46). It is especially interesting to note that she describes and figures the segmental cardiac nerve fibers (not cells) entering the heart of the crane fly, *Pachyrhina cornicina*, and states that they form "varicose branchlets" on the heart wall. Such a finding in two members of the Nematocera should serve as a warning about broad generalizations, showing as it does that within the same family two different mechanisms can exist for regulating a common organ.

The physiological observations on the heart are all concerned with the reversal in the direction of the heart-beats, although she mentions in passing that she blocked the heart with atropine. In well-fed *Anopheles* she observed that forward beating of the heart predominated over backward (or reversed) beating. In dehydrated adults she found that almost exclusive forward beating occurred along with a lowered heart rate. She states that during egg laying the *Anopheles* heart beats backwards (from anterior to posterior end).

Iaguzhinskaia does not mention how she prepared the heart for dissection nor what saline or conditions she employed in her experiments on reversals of heart-beat. This is unfortunate because she mentions irregularity in beating and frequent cardiac arrest in her dissected preparations. She found that tergite movements were less frequent than heart contractions and states that ". . . each contraction of the alary muscles served as a stimulus arousing the automatism of the heart. . . ." This reviewer never observed rhythmical contractions of the alary muscles in a study on the heart of *A. quadrimaculatus*. Iaguzhinskaia proceeds to make an elaborate speculation about the influence of the nervous system on the alary muscles as they affect reversals of heart-beat. In brief, she proposes that there is a periodic reflex stimulation of the anterior and posterior alary muscles which thus bring about reversal of beats. She does not discuss the possibility that back-pressure could initiate backward beating. Experiments made by this reviewer (transection of the heart tube so that the anterior end beats backwards while the posterior end beats forward and reverses) would not seem to support her idea of a reflex stimulation of the alary muscles as the cause of beat reversal.—Jack Colvard Jones.

FOREMEN AND OPERATORS' MANUAL FOR RESIDUAL DDT SPRAYING—MALARIA CONTROL WORK IN TAIWAN, January 1954, 31 pp.; and PART "B"—

DDT SPRAYING—FOREMEN AND OPERATORS' GUIDE, January 1954, 44 pp. Pastor S. Echavez (includes Chinese translation by Wan I. Ch'en). Published January 1954. (Publisher not given.) To quote from the Manual: "The purpose of this manual is to provide the foreman and the sprayer operator in the field a guide so that DDT spraying can be accomplished more effectively. It does not contain all details necessary to meet all kinds of situation, but basic principles are presented so that the operators can be guided in their work."

These two publications, which actually can be considered as two parts of one publication, are printed on alternate pages simultaneously both in English and Chinese. Both publications are illustrated with line drawings.

Although these publications are intended for the Chinese malaria personnel in Taiwan (Formosa) they are of interest to any person who has worked with residual house spraying programs. Local "color" is abundant with such statements as, "In localities where silkworm raising is of considerable importance, it may be necessary to adjust the spraying schedule so that the silkworm is not endangered." Even the Chinese proverbs are not forgotten and such quotes as "one note on paper is equal to ten thousand memories," are included.

The following are some of the items discussed: Description of the compression sprayer, how to prepare the DDT wettable powder suspension, how to spray, measurement of areas sprayed, records, personnel management, cleaning the sprayers, and the method by which DDT controls malaria. Appendices include "Community Spraying Schedule" and "Instructions for Spraying Public Buildings and Shops." Annex I of the

first publication is entitled "The Arithmetic of Spraying Water Dispersible DDT Powder." It is a very useful annex and contains two tables.

Although the name of the publisher is not included, the copies provided this reviewer were received from the World Health Organization Team, Ch'ao-Chow, Ping-Tong, Taiwan (Formosa).—Donald R. Johnson, Div. of International Health, U.S.P.H.S., Washington 25, D. C.

THE USE OF FOGS AND MISTS FOR ADULT MOSQUITO CONTROL. Proceedings and papers of the Toledo Seminar of the American Mosquito Control Association held on September 29, 30, and October 1, 1954. Published by the Toledo Seminar Committee, 5015 Stickney Avenue, Toledo 12, Ohio. \$1.00. The papers in the digest represent the work of several authors. Some are professional entomologists, some are practical mosquito control workers, and still others represent the manufacturers of adult mosquito control equipment. Seven papers are devoted to discussion of such basic mosquito control problems as administration, insecticide formulation, choice of proper equipment, and evaluation of work. The remaining twelve contributions delve deeply into the actual physical problems encountered during misting and fogging operations. Operational problems, safety precautions, communication, maintenance of equipment, and the relative costs of these operations are discussed in considerable detail in organized papers and in impromptu conversation. This digest is a contribution to practical mosquito control written at the layman's level. Although it is not a highly technical publication, it does contain a wealth of common-sense information.—Elinor G. Thomas, Toledo Area Sanitary District, Toledo 12, Ohio.

ANNOUNCEMENT OF ANNUAL MEETING

The 12th annual meeting of the AMCA is to be held at Beaumont, Texas, February 5-8, 1956. It is felt by the officers of the Association that this meeting will be one of the best ever held and will be well worth your consideration. Plan *now* to attend; mark your calendar, save your money, and bring as many representatives from your district as you can.