

## BOOK REVIEWS

**BIONOMICS AND EMBRYOLOGY OF THE INLAND FLOODWATER MOSQUITO *Aedes vexans*.** By William R. Horsfall, Harland W. Fowler, Jr., Louis J. Moretti, and Joseph R. Larsen. September 1973. Published by the University of Illinois Press, Urbana, Illinois 61801, 211 pages, 136 figures. \$10.00.

Many books have been published on mosquitoes but this is the first devoted entirely to a floodwater species. *Aedes vexans* is not only a major pest mosquito and one that may play an important role as a vector of vertebrate pathogens, but it is also one that has heretofore been rather difficult to handle experimentally. This book will thus be welcomed by those engaged in research and control of floodwater mosquitoes.

The first portion of the book entitled *Bionomics* ties together some 20 years of work, much of it carried out in the field by W. R. Horsfall and more recently by H. W. Fowler. The outline followed is similar to that presented in Horsfall's earlier book entitled, "Mosquitoes—Their Bionomics and Relation to Disease." Detailed information is presented on those subjects that have been of major interest to Horsfall. These include the morphology, distribution, and hatching of eggs, dispersal of the adults, and laboratory colonization. Other aspects of the bionomics of *Aedes vexans* are adequately treated.

This part of the book should be useful and informative to individuals engaged in research and control of floodwater mosquitoes. In fact, the practitioners of mosquito control should find it to be one of the most complete accounts of the bionomics of a single species of floodwater mosquito.

The second part entitled *Embryology* is essentially the Ph.D. thesis of Joseph Moretti which was done under the guidance of J. R. Larsen. This is an excellent piece of embryological work and a much needed one for *Aedes* mosquitoes. It is detailed, informative and supplemented with many photographs of cross and longitudinal sections of the embryo at various stages of development. The location and fate of various primordia are given. The embryology of *Aedes vexans* is thoroughly related with that reported for other species of Diptera. This part of the book should be of interest to all insect embryologists.

The average reader may find some subjects difficult to locate without thumbing through the book. The Table of Contents is brief and the Index, though in part adequate, has shortcomings. It would have been helpful to this reader if the Table of Contents had listed all the subheadings presented in the book. The Index is usable, but could be more extensive. For example, if an individual wishes to find information on mosquito control, one will not find it under Control or Insecticides, but will find it under Toxicant.

This book should find its way to the desks and shelves of most academic and governmental scientists interested in mosquitoes and to those engaged in mosquito control; and because of the embryological work, the desks of insect embryologists as well. JOHN F. ANDERSON, Department of Entomology, The Connecticut Agricultural Experiment Station, New Haven.

**BITING FLY CONTROL AND ENVIRONMENTAL QUALITY.** Proceedings of a Symposium held at the University of Alberta, Edmonton, May 16-18, 1972, Anne Hudson, Ed. Information Canada, Ottawa, 1973. 162 pp.

In May of 1972, a distinguished group of research workers met at the University of Alberta in Edmonton to discuss biting flies, with special reference to those occurring in temperate and subarctic climates. It is fitting that this meeting took place in Canada with its increasingly accessible northern areas that contain valuable mineral resources but which also breed hordes of blood-sucking insect pests of man including: mosquitoes, blackflies, tabanids and biting midges. Three points of special interest emerged from the meeting. First, there appears to be a genuine (rather than token) awareness of the need for a detailed knowledge of the taxonomy and biology of biting flies (especially their sensory physiology as it affects behavior). Secondly, entomologists are coming to realize that more quantified data are needed to document and evaluate pest management programs, especially when public funds are involved. Thirdly, it is becoming increasingly evident that entomology (among other scientific disciplines) has lost some of its initiative and suffers from an inability to convince decision makers of the importance of research and application of the results of research to pest management programs. (Could this be the result of earlier unsound, unwise or abortive programs including attempts of worldwide malaria eradication, gypsy moth eradication and *Aedes aegypti* eradication in the United States, etc.?)

Papers on conventional chemical control described current field work in this presently unfashionable and poorly supported area of research. The lack of support for chemical control seems illogical as it is apparent to most scientists that, over the next decade, research on chemicals and application technics will provide most of the information and technology needed for effective pest management programs. The need to investigate the biological effects of chemicals in the environment, their persistence and degradation products was stressed. A review of the current status of juvenile-hormone research concluded that juvenile-hormone analogues may be practical for

control of biting flies, but that this possibility still lies in the future. Papers on biological control stressed mass production of naturally occurring sympatric pathogens. This represents a departure from classical biological control which stressed inoculative introduction of allopatric species that, once introduced, are self-perpetuating. There are, of course, a diversity of approaches to biological control including, in addition to parasites and predators, the application of pheromones to attract or confuse insect populations, manipulation of swarming behavior, control of insect symbionts and genetic manipulation. The consensus was that biological control will, in most cases, not be self-sufficient but will be an important part of integrated control programs.

Another major section of the symposium dealt with "personal protection." Since control of biting flies over large areas containing few people is uneconomical, repellents are sometimes the method of choice, or of necessity. The latest developments in repellent research including space repellents, systemic repellents and factors affecting repellency are discussed. An important point brought out in another paper was that identifications of insects arrived at in pest management programs often do not reach far enough for *practical purposes*. When two or more nearly identical species are present in the same area at about the same time and one is a man-biting pest or disease vector and the other is not, it is essential to distinguish between the two before

pest management procedures can be carried out with maximum effectiveness and at the minimal cost.

The symposium concluded with five resolutions that can be paraphrased and condensed as follows:

1. The problems posed by biting flies should be enunciated and criteria for objectively evaluating the success of pest management procedures should be improved.
  2. Increased resources should be devoted to developing ecologically acceptable chemical and biological insect control methods for integrated pest management programs.
  3. Too little is known of the biology of biting flies especially their sensory physiology and behavior and the difference between naturally isolated species or infra specific entities.
  4. Better methods of personal protection against biting flies are needed, including repellents, and also, interestingly, "the promotion of a more tolerant attitude" toward the annoyance they cause.
  5. Communications should be improved between scientists, decision makers and the public as to the complexities of biting fly research, pest management programs, and the benefits of such programs in relation to their costs described.
- It appears that the Symposium has met with at least partial success as the November 1973 *Geotimes* reported that the Alberta Department of Environment has filled a newly created position of "Coordinator of Biting Flies." HUGO JAMNBACK, Director, New York State Science Service.