REVIEWS AND ABSTRACTS

A GUIDE TO THE MOSQUITO LARVAE OF WESTERN CANADA. J. G. REMPEL.
Canadian Jour. Res., Sec. D, 28:207, 1950.

This well illustrated and authoritative guide to mosquito larvae fills an important need of entomologists working on mosquitoes in the northern part of North America. With a few exceptions the guide will serve entomologists not only in western Canada, but in Alaska as well as throughout the northern part of Canada. Some of the 6 genera and 46 species treated also occur in northern Eurasia. The main value of this contribution is the discovery and use of valuable new taxonomic characters such as the prothoracic and abdominal hairs. These characters permit more accurate field and laboratory identifications and in several cases eliminate the need of a compound microscope for examining details of comb scales. The larval descriptions are concise and contain only the essential diagnostic characters. It is pointed out that "the larvae of some species show considerable variation. Hence the statements in the key refer to general tendencies rather than to absolute conditions." It is regretted that the study was not extended to include the range of variation as well as the average, at least in the case of diagnostic characters of closely related species. An excellent method has been developed for presenting data on prothoracic hairs by a simple formula. The illustrations are clear and excellently drawn and the details are accurately shown.

An omission and some minor criticisms may be noted. *Aedes aboriginis* is a distinct species of the *A. punctor* group from the Pacific coast, but is not included in this paper. The taxonomy of this group of dark-legged adult species is extremely difficult. *Aedes hexodontus* occurs in the region but is not mentioned although *A. cyclocerculus,* which was considered by Matheson as a doubtful species and which has been synonymized by Gjullin and others, is treated. Dr. Rempel finds two apparently distinct species of the *A. lateralis* and *A. sticticus* group based on larvae, while Drs. Alan Stone and Herbert Ross believe them to be one species. No comment is made on the *A. aloponotum* and *A. excrucians* problem in the western region although recent authors disagree about recognizing *A. aloponotum* as a distinct species. *Aedes intrudens* and *A. pionips* are stated to have been reported from Churchill although the published papers do not include these species for the area. *A. pionips* was, however, found there by the reviewer during the summer of 1950.

The data on distribution of the species are brief and do not include all of the published records for the region covered, nor for the entire range of the species concerned. For example *A. nigripes* is said to be reported from Churchill and the Northwest Territories. Many other authentic records have been published for Alaska and northern Canada from Yukon to southern Labrador. It is stated that McLintock did not find *A. impiger* in Manitoba, but McLintock reported a record by Dyar, and other definite records are published for this province. The area covered in the study includes British Columbia, Alberta, Saskatchewan, and Manitoba, the so-called prairie provinces. Yukon Territory and the Northwest Territories are mostly omitted.

Publication of this excellent guide is a distinct advance and will be of great help in studying our northern mosquito fauna. Dr. Rempel's paper is a necessity to anyone working with mosquitoes in the arctic or subarctic anywhere in the world. It is hoped that an illustrated guide to the adult females of these species will be published which will come up to the standard set by this paper.—Dale W. Jenkins, Army Chemical Center, Edgewood, Md.

ANNUAL REPORT OF THE MALARIA DIVISION., Trinidad Government, British West Indies. 1949. 89 pages, (Processed). This report is a detailed one covering the program of work of the Malaria Division, Health Department for the Islands of Trinidad and Tobago in cooperation with the Rockefeller Foundation for 1949. The direction of the program is still under the able guidance of Dr. H. P. S. Gillette, malariologist. He is assisted by Major R. A. Senior-White, entomologist, and a field staff of sanitary inspectors, field assistants, and laboratory technicians. We are interested in the consistent reduction in malaria transmission in the two colonies for the past eight years as follows: 1942—562 deaths; 1943—603; 1944—472; 1945—418; 1946—353; 1947—217; 1948—177; and 1949—148 deaths. Dr. Gillette's report is divided into 4 sections: (1) malaria studies; (2) anopheline investigations, research and routine; (3) malaria control, temporary and special measures; and (4) general—special reports. The malaria studies include school surveys and in this connection 672 children were examined for splenomegaly, 15 having enlarged spleens. The Slide Diagnostic Service examined 10,424 slides finding 959 positive (9.2%). The anopheline investigations, reported by Major Senior-White, were given in some detail also and included a large amount of ecological data on *Anopheles aquasalis, A. neomaculipalpus,* and other species. The routine supervision of 26 Shannon Dawn traps was in charge of William Jurawan. According to the report the daily trap collections revealed accurate indications of the breeding conditions and effectiveness of the control methods. *Aquasalis* collections dropped gradually from a high in January to negative in April and then increased with the rains in May reaching a peak at the height of

the rainy season in July. *Anopheles neomaculipalpus, oswaldoi,* and *albitarsis* showed marked increases during the rainy season as their principal breeding grounds, rice fields and vegetable gardens, could not be controlled by oiling. According to the report, the Malaria Division conducts extensive control measures of a temporary nature in several areas but unfortunately there does not exist within the organization a Sanitary Engineering unit. Important permanent work is therefore held to a minimum. The main effort in controlling malaria in the two colonies is residual DDT spraying. In Trinidad this amounted to $41,892.78, the average cost per house was over $1.65 and 30¢ per person. Every house on Tobago, over 7500, was sprayed with DDT twice during the year. The spraying of Bromeliads with copper sulfate solution and manual removal of the major host plant of *Anopheles bellator* was continued. During the year 20,200 pounds of copper sulfate were used for this purpose.—H. H. Stage.

PROCEEDINGS AND PAPERS OF THE EIGHTEENTH ANNUAL CONFERENCE OF THE CALIFORNIA MOSQUITO CONTROL ASSOCIATION. FEB. 1, 2, 3, 1950. EDITED BY H. F. GRAY, R. F. PETERS, AND G. E. WASHBURN. 90 PP. PUBLISHED BY THE CALIFORNIA MOSQUITO CONTROL ASSOCIATION, P. O. Box 649, BERKELEY, CALIFORNIA. Meetings were held at the University of California and opened with a fitting tribute to the late Professor W. B. Herms. A series of symposia featured the meetings.

R. B. March and R. L. Metcalf introduce the symposium on Toxicants and Their Use in California Mosquito Control by a review of current work on insecticide resistance of houseflies. Resistance of *Aedes nigromaculis* larvae to DDT is shown to be the result of a system of larviciding whereby repeated applications of a single toxicant operates as a method of natural selection (R. M. Bohart and W. D. Murray). Dr. Bohart also reports on the value of laboratory studies of resistance. The major health hazard resulting from the increased use of organic insecticides is reviewed by L. Schmelzer. The problems posed by residual insecticides are quite different from those arising in connection with the use of the non-residual but more toxic organic phosphates.

A symposium on Water Resources Development as Related to Mosquito Abatement emphasizes the necessity of active cooperation among all parties involved. Current developments will magnify the problems faced by Health Agencies (J. A. Rowe). G. E. Smith reviews the problems created by irrigation developments; increased mosquito control problems associated with the Central Valley Project are discussed by W. J. Buchanan. The problem of water pollution is discussed by F. M. Stead.

The necessity of an entomological approach to mosquito control is emphasized in the symposium on the Place and Scope of Ecology as it is Related to Mosquito Control. A review of ecological contributions from California (W. C. Reeves), the value and necessity of ecological knowledge (G. E. Smith), the ecology of *Aedes* species (D. C. Thurman, Jr.), anopheline ecology (B. G. Markos), and the ecology of *Culex* mosquitoes (B. Brookman) are of interest to ecologists and control workers alike.

The Place and Scope of Eliminative Control Activities in California Mosquito Control was considered in a final symposium. The theme is given in the remarks of H. F. Gray who points out that while dependency on insecticides as the primary control measure is a serious error, failure to use the proper insecticides effectively in their proper place is equally a mistake. A series of papers presents the varied nature of problems and of methods of attack throughout California.—A. S. West, Queen's University, Kingston, Ontario, Canada.

THE TOLEDO AREA SANITARY DISTRICT, 3RD ANNUAL REPORT. 1949. 31 pp. H. A. Crandell, Superintendent, 5015 Stickney Avenue, Toledo 12, Ohio.

This is a most comprehensive report dealing with the history of the district, types of problems in the area, methods and techniques of control, fiscal data, records of personnel and equipment, along with an appraisal of the effectiveness of their mosquito control activity.

The district was created in September 1945 for mosquito control purposes. It comprises an area of 150 square miles in and about the city of Toledo, protecting an estimated population of 373,000 people. For the year 1949 the district had an assessed valuation of $493,161,480, operating on a budget of $135,125, at a tax rate from 0.104 to 0.288 mills per dollar of assessed valuation. In August 1947 the problem of fly control was included as a part of the district's program of activity.

The problems of mosquito control are those primarily concerned with the following ecological or biological associations listed in the order of their importance:

1. Floodwater breeders—*Aedes vexans*
2. Artificial container breeders—*Culex pipiens, C. restuans*
3. The woodland breeders—*Aedes stimulans, A. impiger*
4. The swamp pond breeders—*Mansonia perturbans*
5. The stream, ditch breeders—*Culex restuans, C. pipiens*

For the first three years of operation emphasis was placed upon chemical treatment methods of control. As heavy equipment is acquired it is expected that more filling, ditching and draining work will be undertaken to supplement this activity.

Operations have been directed against both larval and adult stages of the mosquitoes, using power dusters and sprayers, mist blowers and Tifa aerosol units. Floodland breeders, *Aedes vexans,* are successfully controlled by applications of 1½# DDT to the acre in dust form as pre-hatch

treatments. Larvicides are primarily ¼% solution of DDT oil in water emulsion containing 10% fuel oil #2. The standard aerosol solution successfully used has been 5% DDT in fuel oil #2.

Larval stations and light trap collections have been used as an index to assess the degree of control obtained. Collections within the controlled area compared to those outside the district have shown a very satisfactory degree of control for the 1949 season.

Due to press of the mosquito control problem little time has been available for fly control activity to date. This work has been limited to occasional applications of 5% DDT oil solution on dumps and about the City incinerators, resulting in a marked reduction of the local fly population.

The year of 1949 is one of historical significance to the district. In March it completed construction and moved into what may be considered one of the finest headquarters and utility buildings for a mosquito abatement district in the country.—A. F. Geib, Kern Mosquito Abatement District, Bakersfield, Calif.

THE ANNUAL REPORT, 1949, OF THE BOX ELDER MOSQUITO AND FLY ABATEMENT DISTRICT by Karl L. Josephson, Supervisor, Box Elder Mosquito and Fly Abatement District, Brigham, Utah.

MOSQUITO ABATEMENT ACTIVITY

Mosquito control activities began in late March when a new jeep with power sprayer, spray boom, high pressure hose and adjustable spray gun was put into the field. With this unit supplementing the large Ironage power sprayer in use, 260,000 gallons of emulsifiable DDT was used during the season for both larviciding and adulticiding purposes. Many special spray and aerosol applications were made during the season for control of adult mosquitoes at public gatherings such as picnics, ball games, 4th of July celebrations, etc.

As a result of floods and rains in the Willard area during May 17, 18 and 19, tremendous numbers of *Aedes dorsalis, A. nigromaculis* and *A. vexans* emerged and on May 31 moved in clouds into communities as much as 20 miles distant.

The district hopes to use airplane spray applications during 1950 for control of *Aedes* developing in large, inaccessible swamp areas.

The value of permanent control measures is well appreciated by the district and it is hoped that drainage work can be greatly augmented in future operations.

FLY ABATEMENT ACTIVITY

The district began its fly control activity in 1949 with the objective of spraying every building in Box Elder County (9000 square miles) for flies, earwigs, adult mosquitoes and other insects. The spraying began in early June using four 100-gallon Dobbins pressure sprayers each with 125 feet of high pressure hose and a crew of two men. Four thousand six hundred (4600) parcels of property were sprayed with 17 tons of 50% wettable DDT in 88,000 gallons of liquid. All cities and communities in the district were sprayed in addition to rural buildings and upon request over 100 premises were sprayed a second time, for which a charge was made.

The Superintendent reports almost 100% success in the control of earwigs in the County.

Expenditures for all control activity during the year amounted to $25,911.67.—A. F. Geib, Manager, Kern Mosquito Abatement District, Bakersfield, Calif.

THE USE OF PETROLEUM OILS IN MOSQUITO CONTROL. H. H. Stage. 1950. Preprint, Prepared by Div. Pet. Chemistry Symposium American Chemical Society, Sept. 1950, Chicago, Ill. (Price, $1.00.) This paper is part of a symposium before the American Chemical Society, on "Agricultural Applications of Petroleum Products." Mr. Stage has done an admirable job of assembling the available information, analyzing it, and indicating the lacunae and the areas for needed investigations.

Petroleum oils are considered not only as larvicides *per se*, but also as solvents or vehicles for various toxicants, either as larvicides or adulticides. The bibliography is extensive, and practically no significant references, as known to the reviewer, have been omitted.

One of the most valuable features of this paper is the exhibition of the divergent ideas as to specifications for oils as larvicides. Stage presents a proposed standard specification prepared at his request by Messrs. Nelson, Pierce and Donlan of Standard Oil of New Jersey, in which the newer concepts of Kauri butanol value, aniline point, aromatic content, and DDT solubility are added to the older items of viscosity, specific gravity, boiling points and interfacial tension. It would be very desirable to have some mosquito control organization conduct tests of oils prepared under these suggested specifications to determine how effective and useful they will be in actual practice, and what the relative costs of such oils wil be as compared with the usual commercially available oils.

The characteristics of organic and inorganic surface films on water, and their resistance to spread of oils, is described. These important items are too frequently ignored.

The greater part of the paper is concerned with the use of petroleum oils as solvents or carrying agents for insecticides such as DDT, either for larvicidal or adulticidal operations. The information presented is concise but adequate.

The reviewer would disagree with the author on only one point—his requirement for a larvicidal oil that it "leave a long-lasting film". Over forty years of experience has taught the reviewer that, in practice, this criterion is illusory and chimerical.—H. F. Gray