REVIEWS AND ABSTRACTS

FIELD EXPERIMENTS WITH DDT EMULSION AND WETTABLE DDT WITH SPECIAL REFERENCE TO MALARIA INCIDENCE IN SWAZILAND DURING THE TRANSMISSION SEASON 1949/50. By O. Mastbaum. United Nations, World Health Organization, African Malaria Conference 7, Oct. 9, 1950. An experiment was set up whereby nearly 23,000 native huts, housing approximately 35,000 persons, were sprayed with one application of DDT, either a three and one-half per cent emulsion or a five per cent wettable powder. Using hand sprayers, a total of 9,900 gallons of spray was applied to the interior of the huts.

Weekly checks for *Anopheles gambiae* hut infestation were made from February to June. About five per cent of the total dwellings sprayed were sampled.

During the non-transmission season a survey was made on 500 children under 12 to determine the static load of parasites carried over. During the transmission season over 3000 blood smears were examined to determine degree and type of parasitic infection.

The same sampling procedure was followed in untreated control areas.

A considerable reduction in numbers of *gambiae* (not exceeding 0.04 per month) was obtained in sprayed areas for at least three months. No control differences were noted between the two types of DDT.

In epidemic and endemic areas there was no rise in malaria incidence over that recorded for the non-transmission season; however, in view of the low *gambiae* infestation, transmission was remarkably high in hyperendemic areas. Though difficult to explain, certain influencing factors are discussed.—R. F. Darsie, University of Delaware, Newark, Delaware.

THE SPECIES AND SUBSPECIES OF VECTORS AND THEIR BIONOMICS. By Botha De Meillon. United Nations, World Health Organization, African Malaria Conference 10, Oct. 10, 1950. The report is based on the author's recent book "Anophelini of the Ethiopian Geographical Region" (reviewed in MOSQUITO NEWS 8(4):198, 1948) and subsequent information supplied by collaborators. A list of twenty species and subspecies of *Anopheles,* found infected in nature with malaria parasites, is given. The geographical distribution, known information on adult and larval bionomics, abundance, and relative importance as a vector are included.

The two major malaria carriers, *gambiae* and *funestus,* are treated quite thoroughly. The author points out that *gambiae,* by far the most important vector of epidemic malaria in Africa, is markedly influenced by climatic conditions, and therefore, behaves differently in the various parts of its range.

Under certain conditions two of the secondary vectors, *moucheti moucheti* and *gambiae melas,* are principal malaria transmitters.—R. F. D.

NOTE ON MALARIA EPIDEMIOLOGY IN FRENCH WEST AFRICA. By M. M. Holstein. United Nations, World Health Organization, African Malaria Conference No. 6, Oct. 3, 1950. The author lists the *Anopheles* mosquitoes identified between Aug. 1, 1948, and Mar. 31, 1950, in nine territories of French West Africa. Results of 8000 mosquito dissections reveal that *gambiae, funestus,* and *rufipes* show the highest rate of infection with sporozoites and oocysts. These three species are rated as primary vectors of malaria, while *nili* and *pharoensis* are secondary vectors, and *hancocki* and *domicolus* subsidiary vectors. In a discussion of the primary vectors, the author points out that in certain localities *rufipes* is the main carrier. He maintains that *funestus* and *gambiae* are of equal importance in transmission of malaria, when the year-round picture is considered.

A survey of one district (Bobo-Dioulasso) disclosed that *Plasmodium falciparum* was involved in over 90 per cent of the malaria cases.—R. F. D.

ANOPHELES AND MALARIA IN THE NEAR EAST. By H. S. Leeson, W. H. R. Lumsden, J. Yofe, and T. T. Mecan. London School of Hygiene and Tropical Medicine, Memoir 7, pp. xii and 223, figure 73, 1950. H. K. Lewis & Co. 35 shillings. This is the first memoir of this series published since 1932 and it consists of three separate papers on different areas of the Near East. The first of these (by Major Leeson) covers Syria and Lebanon, the second (by Drs. Lumsden and Yofe) Transjordan, Palestine and Syria, and the third (by Dr. Macan) Iraq and northern Persia. As Professor Buxton states in the introduction, these areas are of particular interest to the entomologist and malariologist since much of the area is semi-arid and because it lies between the great faunal areas of the Palaearctic, Ethiopian, and Oriental Regions—the majority of the *Anopheles* species coming from the first of these. The papers are the results of military epidemiological work done in these areas by Malaria Field Laboratories of the Royal Army Medical Corps and are primarily of the survey type, giving very valuable information on geography, meteorology, and mosquito and malaria incidence. The principal vectors are: *Anopheles sacharovi, A. claviger, A. superpictus, A. sergenti, A. stephensi,* and *A. maculipennis,* the latter being important only on the Persian plateau, *sergenti* only in Transjordan, Palestine and Syria, and *stephensi* only on the alluvial plain of Iraq. A few taxonomic notes are given but there are no keys or descriptions of the species. The illustrations consist primarily of maps, splendid photo-

graphs showing environments, and charts of malaria and mosquito incidence. This is a very fine work to reactivate this Memoir series, and will be of utmost value to anyone interested in reducing the toll of malaria in the Near East.—Alan Stone, Bureau of Entomology and Plant Quarantine, Washington, D. C.

THE OCCURRENCE OF *Anopheles crucians* IN GUATEMALA. J. M. Brennan. Am. Jour. Trop. Med. 31(1):138, 1951. A new distributional record is given for *Anopheles crucians crucians* Wiedemann. Heretofore, according to Kumm, it was confined in Central America to the Atlantic slope of British Honduras, Honduras, and Nicaragua. The present report extends the distribution to the Pacific slope; and, for the first time, records its presence in Guatemala. There is reason to believe that the species may be, and very possibly has been for some time, well established in this area.—D. V. Jensen, National Institutes of Health, Bethesda, Md.

A STUDY OF THE CONCENTRATION OF YELLOW FEVER VIRUS WHICH WILL INFECT CERTAIN SPECIES OF *Aedes* MOSQUITOES. By H. W. Kumm, and H. W. Laemmert, Jr., Am. Jour. Trop. Med. 30(5):749–755. 1950.

1. A study was made of the concentration of virus which was necessary to infect certain species of *Aedes* mosquitoes with yellow fever.

2. The lowest titer at which transmission by bite occurred was $10^{-8.0}$.

3. Half or more than half of the mosquitoes, which fed on primates circulating yellow fever virus at titers of $10^{-5.0}$ or above, became infected after extrinsic incubation periods of at least 28 days at 28° C.—Authors' summary.

THE PROPAGATION OF JAPANESE ENCEPHALITIS VIRUS IN THE MOSQUITO BY PARENTERAL INTRODUCTION AND SERIAL PASSAGE. By H. S. Hurlbut. Naval Medical Research Institute, National Naval Medical Center, Bethesda, Md. Project NM 005, 048. 03.11 (Formerly NM 005 007). Aug. 1950.

1. Propagation of the virus of Japanese encephalitis in *Culex quinquefasciatus* was demonstrated by parenteral injection and serial passage.

2. The emulsified whole bodies of the mosquitoes gave LD_{50} titers of 6.5–8.4 when injected intracerebrally into mice.

3. Virus could be demonstrated in appreciable amount 24 hours after injection into the mosquito and was present in relatively high concentration after 48 hours. Close to the maximum titer appeared to be reached on the third or fourth day and presumably there was no great change thereafter for as long as 17 days.

4. Mosquitoes which were injected parenterally with the virus transmitted it to suckling mice by bite after as little as 48 hours of incubation at 30° C.—Author's summary.

Ed. Note: The mosquitoes were anesthetized with carbon dioxide; a steel needle about 0.1 mm. in diameter was wet with the virus suspension and inserted through the body well into the thorax.

MOSQUITO FAUNA OF JAPAN AND KOREA. Pp. 1–268 and appendices pp. 1–7 and 1–213. 95 plates, 95 figs. Walter J. La Casse and Satyu Yamaguti. Office of the Surgeon HQ 8th Army, APO 343, 1950.

In MOSQUITO NEWS 8(4):200, 1948, I reviewed a work by the same authors under the same title. We now have a greatly revised and much improved edition. The first portion is taxonomic and 51 species or subspecies of mosquitoes are treated, 13 more than in the previous edition. One new species, *Culiseta nipponica,* is described from the larva. Keys are given for the species wherever necessary and each species is described as fully as possible, with excellent plates showing adult, larval and pupal characters. The biology of each is discussed at considerable length, wherever this is known, and a map is given showing Japanese distribution. The first appendix of 7 pages describes the female genitalia for 17 genera or subgenera. The second appendix contains 11 sections dealing with biology, control, technique, disease transmission, and Korean distribution, with many figures, tables, and graphs. The final illustration shows the staff of seven artists preparing the plates under Dr. Yamaguti's direction. It is an excellent work and should be in the hands of everyone seriously interested in the mosquitoes of Palaearctic Asia. Specialists may obtain a copy from Lt. Col. F. W. Whittemore, Div. of Prev. Med., Office of the Army Surgeon General, Washington 25, D. C.—Alan Stone, U. S. Dept. of Agriculture, Washington, D. C.

STUDIES ON *Aedes vexans* (Meig.) AND *Aedes sticticus* (Meig.), FLOOD-WATER MOSQUITOES, IN THE LOWER COLUMBIA RIVER VALLEY. C. M. Gjullin, W. W. Yates and H. H. Stage. Ann. Ent. Soc. Am. 43(2):262–275. 1950. The flooded lowlands of the Columbia River Valley present ideal breeding places for the floodwater mosquitoes, *Aedes vexans* and *A. sticticus.* Over a period of 18 years numerous studies were conducted and many conclusions were reached.

Eggs, laid by caged females after a blood meal, developed completely in 9 per cent of those 4 to 6 days old; in 75 per cent of those 8 to 10 days old. It was found in 1939 that the eggs would not hatch in tap water or in water taken directly from the Columbia River, but that they would hatch in water containing small amounts of certain amino acids and potassium phosphate. In later studies it was discovered that the eggs hatched because of the reduction of dissolved oxygen. This reduction serves as a regulating mechanism insuring that the eggs will hatch only in the favorable environment of shallow water having an abundance of food material for the larvae.

It was determined that winter dormancy of eggs is caused entirely by low temperatures, since

hatches of dormant eggs have been obtained from heating soil samples before flooding. The time required for the *Aedes vexans* and *A. sticticus* eggs to hatch after they have been flooded varies with the degree of dormancy and with the temperature of the water at the time of flooding. Only a small percentage of these species' eggs hatch when water stands over the eggs continuously from late winter through the spring and summer months.

Studies of the distribution of these eggs in the Columbia River Valley have been made by taking 2 quart soil samples from many areas. The bulk of the eggs of these species are laid on ground flooded between the 10- and 20-foot levels of the river. Eggs were more prevalent in swales, pot holes and gullies than on level ground and ridges. Ground of a loam texture with a covering of vegetation and humus is preferred to bare areas exposed to the sun and wind.

The natural survival time of *Aedes vexans* and *A. sticticus* eggs was determined by biennially flooding cages containing top soil samples. It was observed that eggs of both species will survive in large numbers for two or three years and that small numbers of eggs may even survive for four years.

The viability of eggs is greatly reduced by a low moisture content in the soil. Placing egg-free soil over soil samples containing eggs resulted in a diminished per cent of hatching. Several species of Coleoptera were reported to be predaceous on *Aedes* eggs.

The time required for development of the aquatic stages is decreased with high temperatures and abundance of food. Larvae prefer shallow water of a neutral pH. Predators of *Aedes* larvae and pupae include the chironomid larvae of the genus *Palpomyia,* and the flatworm, *Palmaria maculata.* Experiments with *Gambusia patruelis* were unsuccessful due to predaceous fish.

A study was made of thousands of adult mosquitoes to determine the seasonal variations of sex ratios. Males predominated for 20 days after emergence due to the rapid dispersion of females. Then the greater longevity of the females caused the males to become less numerous.

The range of flight as determined by tests was 3 miles for *Aedes vexans* and 5 miles for *A. sticticus. A. vexans* predominated at ground level, while *A. sticticus* was numerous at 20–30 feet.

It was found that *sticticus* bites considerably less at night than in the daytime; little change between day and night was noted in the biting rate of *vexans.*

The relation between clothing colors and biting rate of *A. sticticus* suggest that colors are chosen on the basis of their spectral reflectances.

Naturally-mated females of both species readily lay eggs in laboratory cages if given blood meals. Under cage-mating conditions *Aedes sticticus* laid more than *A. vexans.* Although blood meals were readily taken by virgin females of *Aedes sticticus* and *A. vexans, sticticus* laid no eggs while embryos failed to develop in eggs laid by *vexans.*—H. A. Crandell, Toledo Area Sanitary District, Toledo, Ohio.

Anopheles (Anopheles) guarao SP. NOV. By Pablo J. Anduze and Antonio Capdevielle. Bol. de Ent. Ven. 8(3 & 4):119–124, 1949. The larva, pupa, adult, and male terminalia are described and the pupa figured for *A. guarao.* In an earlier paper by the authors the species was confused with *Anopheles (Shannoniella) mediopunctatus* Lutz (en Theobald) and the species is herein clarified. The terminalia of *A. guarao* resembles that of *A. punctimacula* but the adult is similar in coloration to *A. mediopunctatus,* which is of a different subspecies. In the larval stage there are many variations in the preclypeal external hairs and thus the larva may be easily confused with *A. neomaculipalpus.*—Ernestine B. Thurman, Bureau of Vector Control, Berkeley 4, California.

BIOMETRICAL STUDIES ON INTERGRADATION IN THE GENITALIA OF CERTAIN POPULATIONS OF *Culex pipiens* AND *Culex quinquefasciatus* IN THE UNITED STATES. By S. Sundararaman. Amer. Jour. Hyg. 50(3):307–314, 1949. Evidence is presented after the study of lengthy series of specimens to substantiate early theories and the recent work of Farid (1949) determining *Culex pipiens* Linnaeus, 1758 and *Culex quinquefasciatus* Say, 1823 to be subspecies. The range of variation in the dorsal and ventral arms of the phallosome of wild-caught males of the northern *C. pipiens* was compared with that of the southern *C. quinquefasciatus* and with laboratory-reared hybrids. The author's summary is:

1. Measurements made of the genitalia of *Culex pipiens* from Baltimore, Md., *Culex quinquefasciatus* from Texas and Georgia, laboratory hybrids and *Culex quinquefasciatus* from Alabama, favor the adoption of the ratio of the distance between the tips of the dorsal arms and the distance between the tips of the dorsal and ventral arms as a means of identification of these populations.

2. Experimental hybrids obtained from two successive generations of homologous crosses between *Culex pipiens* from Baltimore and *Culex quinquefasciatus* from Texas exhibited intermediate genitalic characteristics.

3. A few specimens caught in what may be the mid-zone of the range of *Culex pipiens* and *Culex quinquefasciatus* also had intermediate genitalia similar to those of the experimental hybrids. The Alabama *"C. quinquefasciatus"* colony may have been established from naturally occurring hybrid specimens.

4. Since hybridization between the northern and southern types appears to occur in nature as well as in the laboratory it is believed that the northern *Culex pipiens* and southern *Culex quinquefasciatus* are subspecies.—E. B. T.