are as follows: *A. p. punctulatus,* 53 per cent; *A. annulipes,* 38 per cent; *A. p. farauti,* 23 per cent; and *A. amictus amictus,* 1 per cent.

Taking the above vector qualities into consideration, the Australasian anophelines are placed into the following groups:

Proven dangerous vectors: *Anopheles p. punctulatus* Don. and *A. p. farauti* Lav.

Potential vectors under locally favorable conditions: *A. annulipes* Walk., *A. bancrofti bancrofti* Giles, *A. subpictus* Grassi, *A. amictus hilli* W. and L., and *A. a. amictus* Edw.

Unknown, but at most locally significant: *A. meraukensis* Venh. and *A. novaguenensis* Venh.

The primary vectors of New Guinea and the islands are the races of *Anopheles punctulatus,* the vector of Northeastern Queensland is *Anopheles p. farauti,* and the presumptive vector of sporadic malaria in the South is *Anopheles annulipes.* The vectors of the Northern Territory, however, are still undetermined. No permanent change in the distribution and amount of malaria on the mainland of Australia is expected unless a new vector is introduced. The possibility of introduction of *A. punctulatus punctulatus* into the tropical parts of the mainland cannot be taken lightly.—ROY W. CHAMBERLAIN, The Johns Hopkins University, Baltimore, Md.

THE EXPERIMENTAL USE OF DDT SPRAYS AS MOSQUITO LARVICIDES. By E. H. Arnold, Frederick F. Ferguson, and William M. Upholt (Malaria Control in War Areas, U. S. Public Health Service). Public Health Rpts. Suppl. 186:66–79. 1945.

Studies to determine the usefulness of DDT when substituted in part for fuel oil in anopheline larviciding are reported. Applications were with hand equipment, both compressed air sprayers and knapsack sprayers, and results were checked by dipping for larvae before and after treatment. Several types of application were tried: (1) a tight emulsion of No. 2 fuel oil containing DDT and water; (2) a quick-breaking emulsion of the same type (referred to as surface application); (3) a suspension produced by dissolving the DDT in ethyl alcohol and then diluting with water; and (4) bottom applications obtained by dissolving the DDT in a heavier-than-water solvent. Solvents tested included pine oil, sulfonated pine oil, xylene, kerosene, and a gas condensate liquor, as well as No. 2 fuel oil. In the tight emulsion, *Triton* X-100 was used as emulsifier; and in the quick-breaking emulsions, *B1956* or *Artic Syntex A* was used as emulsifier. *Intracol* was used as a dispersing agent in the alcoholic suspensions.

The bottom application was impractical to apply, but all of the other types of applications resulted in good control of mosquito larvae when applied at the rate of 0.1 pound DDT per acre. No appreciable residual effects were noted at dosages that were not obviously harmful to wildlife. Laboratory evidence supported the field observation that the distribution of the DDT, and thus its toxic action, was limited to the distribution of the solvent.

Further laboratory investigations indicated that one important factor in the failure to obtain residual effectiveness in field application was the inactivation (without decomposition) of the DDT by some factor in the bottom-mud complex.

Limited dosage-mortality and time-mortality studies in the field indicated that good larval control could be obtained with dosages as low as 0.006 pound per acre with some types of application.—W. M. UPHOLT.

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TECHNIQUES AND APPARATUS USED IN EXPERIMENTAL STUDIES ON DDT AS AN INSECTICIDE FOR MOSQUITOES. By S. W. Simmons and Staff (Malaria Control in War Areas, U. S. Public Health Service). Public Health Rpts. Suppl. 186:3–20. 1945.

Window traps can be used for the determination of the subsequent kill of mosquitoes leaving rooms treated with DDT. The greatest difficulty has been experienced in determining effective kills and in keeping the mortality in check cages at a minimum. Humidity, wind, and temperature are factors of outstanding importance in the well-being of mosquitoes held in cages. Mortality due to natural causes or to handling should be kept below 20 per cent. Experiments should be conducted in areas having large mosquito populations in order to secure significant catches in the window cages.

The wall-cage test is a biological method of determining the residual toxicity of treated walls. Insects placed in glass chambers were exposed to treated walls for specific time intervals and then held 48 hours for observation of mortality.

The wall-cage test has been used successfully with both house flies and mosquitoes and undoubtedly could be adapted for testing other insects. The accuracy of the results, particularly when testing mosquitoes, depends to a large extent on the careful handling of the specimens both during and after the test.

A rapid, uniform, accurate, and widely applicable laboratory technique has been devised for testing the effect on adult mosquitoes of spray residues on various surfaces. Panels having a total surface of 1 square foot are fitted into a wooden framework and adult mosquitoes are introduced into the exposure chamber formed by the panels. After known periods of time they are removed and held for 48 hours to determine mortality. Transfer of adult mosquitoes from chambers to cages is accomplished by air currents. Each complete test requires approximately 15 minutes and no injury to mosquitoes or spray residues is evident. Uniform comparable results have been attained in replicated tests and good correlation with field results has been obtained.

The techniques employed in the laboratory test-

ing of DDT as an anopheline larvicide are briefly described.—Author's summary.

THE EXPERIMENTAL USE OF DDT IN THE CONTROL OF THE YELLOW FEVER MOSQUITO *Aedes aegypti* (L). By W. M. Upholt, T. B. Gaines, S. W. Simmons, and E. H. Arnold (Malaria Control in War Areas, U. S. Public Health Service). Public Health Rpts. Suppl. 186:90–96. 1945.

Field and laboratory tests showed that DDT was a very satisfactory larvicide for the control of *A. aegypti*. When applied in a variety of typical *A. aegypti* breeding places, it remained effective over a period of five to six months or more. Even water removed from containers that had been treated 5 months previously and left in the open was highly toxic to insectary-reared larvae. The results were the same in metal, glass, wood, or rubber containers even in the presence of rust. (Of course no large amount of mud was present.) In the laboratory, larvae were affected much more rapidly than larvae of *Anopheles quadrimaculatus* but required a longer time to succumb. DDT at 1 ppm did not appear to prevent oviposition nor did it appear to kill eggs, but all larvae hatching from eggs deposited on treated surfaces, succumbed soon after hatching (the eggs were not removed from the treated surface). Dosages of DDT below 4 ppm did not kill pupae.—W. M. UPHOLT.

THE DEVELOPMENT AND LONGEVITY OF *Haemagogus* MOSQUITOES UNDER LABORATORY CONDITIONS. By M. Bates. Ann. Ent. Soc. Am. 40(1): 1–12. 1947.

The author has given detailed experiments which were carried on to test the effect of food and larval temperature on mosquitoes, especially *Haemagogus spegazzinii*. Studies of culture media involved different types of infusions. Results with Brewer's yeast were consistent and this was adopted as standard medium, both for raising larvae and for stimulus of eggs.

The larval development required 26 days at 20° C., 18 days at 25° C., 15 days at room temperature, and 12.5 days at 30° C. Adults from larvae kept at lower temperatures were larger and hardier than those kept at higher temperatures. Twenty degrees Centigrade was adopted as a routine temperature for raising adults. The males developed faster than the females, the increase in development speed being demonstrable from the second larval stage on.

Longevity of the *Haemagogus* mosquitoes is discussed in detail. Individual mosquitoes were kept in glass vials with a layer of moist cotton covered with filter paper on the bottom and the vial plugged with a cup of aluminum (or monel) wire screening. The best results were obtained in a relatively dry atmosphere (70 per cent relative humidity) with a constant air movement provided by an electric fan. Studies were made on the effect of temperature on *Haemagogus* adults along with the temperature effect on yellow fever virus development.

Throughout the paper, the author compares the diurnal forest mosquitoes *(Haemagogus)* with other species. The relation between the laboratory results and the habits of the mosquito in nature is discussed, together with some comment on the significance of the concept of "optimum temperature."—ABBY H. CASANGES, Beltsville, Md.

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BIOLOGICAL CHARACTERISTICS OF LABORATORY-REARED *Aedes atropalpus*. By H. L. Trembley. Jour. Ec. Ent. 40(2):244–250. 1947.

Aedes atropalpus, a species of rock-hole mosquito, has been added to that small group of mosquitoes which are autogenous. The females do not require blood meals, or, in fact, any food at all, in order to deposit viable eggs. A colony in which the females were fed only a sugar solution was reared in the laboratory for more than a year, and in its 26th generation continued with no apparent loss of vigor. A colony in which the females received only distilled water for several generations was thriving at the time the article went to press. A comparison of the life-cycles of individuals from the colony routinely offered blood and those denied blood showed no marked differences. The females of this species may be induced to bite when blood meals are offered, but subsequent oviposition results in comparatively few viable eggs. *Aedes atropalpus* may mate in small spaces, has no seasonal period of comparative inactivity, and does not exhibit a decrease in the number of females with the increase in successive generations.—Author's abstract.