REVIEWS AND ABSTRACTS

THE NATURAL HISTORY OF MOSQUITOES. By Marston Bates. 379 pp., 9 figures, 16 plates. The MacMillan Company, 1949. $5.00.

Through the author's repeated and effective reference to the value of mosquitoes as experimental animals, entirely aside from their economic importance, the reader became convinced that entomologists and zoologists have missed many opportunities to gather basic physiological information.

There is no question that by far the major efforts of nearly all those who have studied mosquitoes have been directed toward practical ends. Certainly we cannot severely criticize those who have had their research dominated by a desire to destroy mosquitoes as annoying pests or as vectors of the scourges of man. Perhaps the trouble is that too few of those engaged in so called pure science have realized the fitness of the mosquito as a subject for fundamental studies of animal habits, responses, general physiology and interorganism relations. The author has pointed out numerous gaps in our knowledge of mosquitoes, and opportunities for students of animal behavior to make contributions to pure science and at the same time provide sounder basic facts upon which to proceed with the war on mosquitoes that is being so vigorously pursued.

It is stated in the preface that much of the voluminous "literature on mosquitoes is an uncritical accumulation of facts that were easy to record, or facts that were related to some momentarily fashionable subject of study or of facts that were needed for the attainment of some immediately practical objective." With this we agree only in part as there have been numerous contributions that are more than an "uncritical accumulation of facts."

The author states "The pile of facts about mosquitoes is an impressive accumulation, one that should be useful to all biologists if only the assortment were a little better organized." He then sets about organizing these facts in the present volume. In this he has succeeded well although some important biological information is conspicuous by its omission.

In the author's words, "The first part of the book is organized around the life history of the mosquito, taking up in turn the characteristics of behavior, physiology, and environmental relations of the adult, egg, larval, and pupal stages. Considerable space is devoted to the relations between mosquitoes and other organisms, especially to the vector relationship with plasmodia and viruses, since this relationship has been the subject of a great deal of study. Here again I have tried to stress differences among mosquito species, since differences in susceptibility to pathogens provide valuable clues to physiological divergences. The succeeding chapters on the species problem and on mosquito classification and distribution are intended to summarize material bearing directly on the problems of evolution. Since I hope that the book will be useful for reference for people actively engaged in mosquito research, a chapter on techniques has been added."

This statement by the author summarizes in a few words and in a broad way the contents of the book. Throughout the work the author has drawn freely from his extensive experience with mosquitoes in the Mediterranean region and in Tropical America.

The work is divided into 20 chapters with an appendix consisting of a systematic list of mosquito species, referred to in the text with their general distribution, bibliography of 552 titles and a fairly satisfactory index. The five chapters following the introduction are devoted to the adult including habitats and biting, flight, sexual and oviposition habits. Chapter 7 deals with the egg in satisfactory style. Chapters 8 to 11, inclusive, consider the larvae including habits, physiology, development and enemies. In the discussion of enemies the author might well have included reference to the comprehensive bibliography of Gerberich on fish as mosquito predators (Amer. Midland Nat., July 1946). The pupa stage is briefly (7 pages) treated in chapter 12.

One should not expect to find in a generalized work of this kind a continuous story of any one species, but rather a composite story. The author has presented well chosen examples of the wide diversities in life cycles and habits to illustrate this composite story.

Chapters 13 to 15 are excellent summaries of the relation of mosquitoes to other organisms including their part in the transmission of diseases. The summary of mosquitoes as vectors of viruses will be found especially useful to medical men.

Some of the problems of the taxonomist are touched upon in Chapter 16 while in Chapter 17 the classification of mosquitoes is broadly discussed.

The classification of Edwards is followed including the use of the name *Culex fatigans* Wied. for the southern house mosquito which we in the U. S. call *Culex quinquefasciatus* Say. The distribution of mosquitoes by faunal regions is taken up in a general way in Chapter 18 with a good set of references to the literature. Some excellent suggestions on techniques of mosquito study are given in Chapter 19 but obviously the coverage of such a broad subject could not be considered in detail in a book of this type.

In the final chapter on the strategy of mosquito research the author again emphasizes his feeling that mosquitoes should have more attention from the biological viewpoint as is illustrated by his statement, "In the area of medical entomology, the development of new and fruitful conceptual schemes would seem to me to depend on a radical shift in point of view; a shift, in fact, from the strategy of medicine to the strategy of biology, since advances in the application of biology must

necessarily depend on advances in biological theory."

The difficulty of including references to all of the important contributions in a field so broad as that attempted by the author is obvious. But it would seem that some of the material rather remotely related to the special theme might have been reduced so that references could have been included to such pertinent articles as the summary of "Mosquito Culture Technique" by Helen Louise Trembley (Mosquito News, Dec. 1944), the paper "Biological Characteristics of Laboratory Reared *Aedes atropalpus*" by the same author (Jour. Econ. Ent., June 1945), the article by M. Greenwald *et al* on the large-scale rearing of *Anopheles quadrimaculatus* (Mosquito News, June 1948), the discovery by Rozeboom (Science, Aug. 1, 1941) of the interrelation between *Anopheles bellator,* bromeliads and malaria, Hearle's "Mosquitoes of the Lower Fraser Valley, British Columbia" (Rept. 17, [Canad.] Natl. Res. Council 1926), King and Rosario's "The breeding habits of *Anopheles litoralis* and *A. indefinitus* in salt-water ponds" (Philippine Jour. of Sci., July 1935), Bradley's ecological study of *Anopheles* in northeastern Louisiana (South. Med. Jour., May 1932), the experience of M. A. Barber in rearing anopheline larvae on pure cultures of food organisms (USPHS Rpts., June 3, 1927), Gjullin's studies on the effect of clothing color on the rate of mosquito attack (Jour. Econ. Ent., June 1947), and Clarke's report on flight range and longevity of mosquitoes (N. J. Mosquito Extermin. Assn., Proc. 30, 1943).

The vast amount of research on *Plasmodium gallinaceum* transmission is given little attention. For example, reference to the ease with which *Aedes atropalpus* is infected (Trembley, Jour. Parasit., Oct. 1946) is omitted.

The author states (p. 84) that no *Anopheles* has been reported to lay eggs without a previous blood meal yet Markovich observed this in *Anopheles claviger* (Med. Parasitol. 7(6), 1938). Although not mentioned, *Aedes atropalpus* has been reported by Trembley (Jour. Econ. Ent., April 1947) to have been carried through 26 generations without access to blood.

The author has tackled a big job and on the whole has done a creditable one, giving the entomologist, the sanitary engineer, the medical man and student of animal behavior a useful reference work.—F. C. Bishopp.

CONTROL OF RURAL MALARIA WITH D.D.T. INDOOR RESIDUAL SPRAYING IN KANARA AND DHARWAR DISTRICTS, BOMBAY PROVINCE: SECOND YEAR'S RESULTS, 1947–1948. By D. K. Viswanathan and T. Ramachandra Rao (Indian Jour. Malariol. 2(3):157–210, 1948. For centuries the Kanara and Dharwar Districts of Bombay have been malarious and have suffered from a gradually declining population. The vector in the Kanara District, *Anopheles fluviatilis,* usually rests outdoors, but when indoors, it prefers houses to cattle sheds. This species is highly anthropophilic. *A. culicifacies,* the carrier of malaria in the Dharwar District, prefers cattle sheds to houses as a resting place during the day.

In order to control malaria in these districts, DDT was applied at the rate of 56 mg. per sq. ft., as was done in the first year of the campaign. Spraying took place once in 2 months against *A. fluviatilis* in houses and once every 6 weeks against *A. culicifacies* both in houses and in cattle sheds. The DDT soap emulsion continued to be the main material used.

As a result of spraying operations during the second year, *A. fluviatilis* has been reduced 99% and *A. culicifacies* 90% as compared with 90% and 70–80% respectively for the first year. Spleen rates in the Dharwar District have been lowered from 19.6% to 10.6% and in the Kanara District from 14.4 to 11.6%. In addition, there were 300–400 less malaria deaths in each of the 2 years, 1946 and 1947. It is estimated that at least 300,000 cases of malaria have been prevented.

The second year's program, covering the largest rural malaria control project ever undertaken in India, has fully confirmed the earlier promising results. During the entire year only 3 specimens of *A. fluviatilis* were collected from sprayed houses in the Kanara District and 20 specimens were caught in unsprayed cattle sheds in the treated areas. In the untreated villages of Kanara, 350 specimens of *A. fluviatilis* or about 1.75 per 10 man hours of collecting were found, being far less than the assumed critical density. In the Dharwar District the density of *A. culicifacies* was a little over 5 per 10 man hours in the unsprayed villages.

During this whole spraying operation, there has not been a single instance of any bad effects due to DDT. Even the 150 members of the staff who handled DDT day in and day out suffered no ill effects during the 2 years' campaign. The success of this program is such that many other villages are clamoring for DDT spraying whether they have malaria or not, because of the control of other insect-borne diseases. The Government of Bombay has sanctioned the institution of a similar program for every village in the Thana District, an area which has a total population of 618,000.—Helen Sollers, Bur. Ent. and Plant Quar., U. S. Dept. Agr.

AIRCRAFT AND PUBLIC HEALTH SERVICE FOREIGN QUARANTINE ENTOMOLOGY. By J. H. Hughes. Supplement 210, Publ. Hlth. Repts., 37 pp. July 1949. Aircraft transactions totaling 215,992 were completed by the Foreign Quarantine Division of the Public Health Service at ports under United States control during the 18-year period 1930 to 1947, inclusive. Approximately 50 percent of this number of planes had entomological significance.

An aircraft disinsectization program, development of which was begun during the early 1930's, had been expanded to meet the foreign quarantine requirements of the Public Health Service. This program has been supplemented by the

entomological surveillance of airport areas and other areas of quarantine interest.

Requirements are given regarding an insecticidal aerosol and its use on aircraft, particularly in the control of mosquitoes and flies.

Findings based on an extensive entomological surveillance program conducted particularly in airport vicinities include one new species of mosquitoes, *Aedes keyensis,* and several records of mosquitoes reported for the first time in the United States. *Anopheles albimanus,* a malaria transmitter in the Caribbean region, was collected in a light trap as far north in Florida as the quarantine station at Fisher's Island, Miami Beach.

A summary is made for aircraft transactions for the period 1938–47, based on findings at Brownsville, Fort Worth, Honolulu, Miami, New Orleans, San Juan, and Terminal Island. During this 10-year period, 80,716 aircraft were inspected for entomological purposes. Of these aircraft, 28,752 (35.6 percent) harbored all entomological specimens found; 3,873 planes (4.8 percent) harbored the mosquitoes. The entomological findings on all planes inspected totaled 106,106 specimens of insects and other arthropods. During the entire period all arthropods found averaged 131.5 per 100 aircraft inspected. Mosquitoes numbered 12,825 for the entire period, with an average of 15.9 per 100 planes inspected.

Most of the insects found belong in the order Diptera (flies, mosquitoes, and others). During 1945, Diptera comprised 78.6 per cent of all entomological findings for the year; 57.8 percent of these Diptera were the housefly, *M. domestica.*

A list was prepared showing the mosquitoes found on aircraft during the 10-year period considered in this report. Ten genera and 73 species of mosquitoes are recorded. The genus *Culex* comprised 70.2 percent of the mosquito specimens. Two and four-tenths percent of all mosquitoes were anophelines.

Thirty-seven species of mosquitoes reported do not occur in all three of the general areas considered. A tabulation has been prepared showing these species, their general geographic distribution, and probable minimum distance transported from their place of origin to the port of interception. Twenty-five species of the mosquitoes found, including 11 species of anophelines, are not indigenous to the United States, Hawaii, or Puerto Rico.

Several species of mosquitoes found are known or suspected transmitters of the causative agents of malaria, dengue, filariasis, encephalitis, and probably other diseases.

Aircraft entomological transactions and findings for the 1945 fiscal year are presented in detailed tabular form. All but 68 of the specimens found during 1945 were insects. Twenty orders, 191 families, 680 genera, and 524 species of arthropods were identified. The total number of arthropod specimens found on 12,367 aircraft was 24,766. During 1945, *Anopheles pharoensis,* a malaria mosquito from Africa was intercepted at Miami; *Anopheles maculipennis aztecus* was first intercepted in this country on a plane which arrived at Brownsville from Mexico.

A tabular comparison of data by month for the 1946 entomological transactions is given.—Author's summary.

DA APLICAÇÁO EXTRADOMICILIAR DE HEXACLOROBENZENO POR MEIO DE HELICÓPTERO NO COMBATE AOS ANOFELINOS DO SUB-GÊNERO KERTESZIA EM MATAS PRIMÁRIAS COM PREDOMINÁNCIA DE BROMÉLIAS EPÍFITAS. By Ferreira, M. O., Rachou, R. G., and Bustamante, F. M. Revista Brasileira de Malariologia 1(2):24–34. April 1949. The companion paper compares the results with two different formulations of benzene hexachloride used under similar conditions. The dust formulation, containing 1.5 per cent of gamma isomer, caused a reduction of 99 per cent in adults two days after application, but had little or no effect on their larvae in bromeliads. The wettable powder, containing 6.5 per cent gamma isomer in 10 per cent aqueous suspension, gave a kill of adults up to 100 per cent between the third and 12th day after application, and a 90 per cent reduction in larvae 3 days after treatment. The cost of application favored the dust, as the helicopter applied it in less time than the aqueous suspension.—W. H. W. Komp, National Institutes of Health, Bethesda, Md.

ALAMEDA COUNTY MOSQUITO ABATEMENT DISTRICT, 1949 Annual Report by Harold F. Gray. The most interesting event during the year was the discovery that the irrigated pasture mosquito *Aedes nigromaculis* found its way into a relatively isolated area of the district from the San Joaquin Valley where it is a severe pest. They hope to be able to keep it in this area, or if possible, extirpate it. The results of this effort will be of future interest. The author states: "Drain systems on the marshes within the district have been improved, extended and maintained. Considerable areas have been reclaimed by dikes and tide gates or by fills, much of it being performed by official agencies or private owners." This is of interest because it shows that the district's operations have continued to follow the tried and proven methods and that DDT has been used simply as a tool and not an exclusive method of control.

All phases of the district's activities are included, from the membership of the Board to the disbursement of the $96,601.40 spent in 1948. It also contains many interesting sections that cover a wide field of operations. The reports on virus studies pertaining to enchephalitis in which 2,227 specimens of species considered as vectors were submitted to the laboratory, all of which proved to be negative, is of interest.

During the year it was necessary to retreat only 35 underground utility vaults of the 2,747 vaults given a residual DDT spray of wettable powder in 1947.

The State Subvention program is mentioned in three or more places in the report. The dissatisfac-

tion or misunderstandings pertaining to this program are discussed.

The author also reports a small amount of residual fly control work, as well as giving assistance to a canning house having difficulty with fruit flies. This, considering the eminence of the author, should help to settle the much discussed point as to whether mosquito districts should undertake activities of this nature.—Fred H. Stutz, Dade Co. Anti-Mosquito District, Miami, Fla.

DA APLICAÇÃO EXTRADOMICILIAR DE DDT POR HELICÓPTERO NO COMBATE AOS ANOFELINOS DO SUB-GÊNERO KERTESZIA EM MATAS PRIMÁRIAS COM PREDOMINÂNCIA DE BROMÉLIAS EPÍFITAS. By F. M. Bustamante, M. O. Ferreira, and Rachou, R. G. Revista Brasilleira de Malariologia 1(2): 1–24. April 1949. Those of us who deal with Anopheles of normal habits may find the idea of a species whose larvae live at tree-top height somewhat fantastic. Nevertheless, in the State of Santa Catarina in southwestern Brazil, several species of the subgenus *Kerteszia* breed in large bromeliads (airplants) in the tops of tall forest trees. They are responsible for a serious malaria problem in the towns and villages situated in forested areas. Removal of the bromeliads by hand has proved costly and dangerous to the workmen. Cutting down the forest around inhabited areas has likewise proved costly. The application of a dust containing 10 per cent DDT by a Bell model 47 helicopter resulted in a reduction of 99.8 per cent in adults two days after treatment, and a continuing effect for as long as 25 days. Larval reduction of 77 per cent was obtained 24 to 48 hours after dusting. The helicopter is considered superior to a conventional airplane, as it needs no landing-strip and is more maneuverable.—W. H. W. Komp, National Institutes of Health, Bethesda, Md.

EXPERT COMMITTEE ON INSECTICIDES. REPORT ON ITS FIRST SESSION, CAGLIARI, 10–15 May 1949. World Health Organization, May 30, 1949. In English. This mimeographed report of 42 pages was sent to the Reviews Editor and may be borrowed by any AMCA members requesting it. Some of the subjects discussed in the sections are: specifications for DDT; disinsectization methods for quarantine purposes; measures to prevent introduction of anophelines into areas free or freed from them; role and limitations of insecticides in domestic fly control; interchange of information and literature; waiving of customs duties on material for insect control; harmlessness of DDT to man; and methods for the determination of the chemical composition and physical characteristics of technical DDT. Interesting report—recommended.—H. L. T.

FILARIASIS CONTROL BY DDT RESIDUAL HOUSE SPRAYING, SAINT CROIX, VIRGIN ISLANDS. I. OPERATIONAL ASPECTS. By Charles E. Kohler, Pub. Hlth. Repts. 64(27):857–862. 1949. The operational phases of an island-wide DDT spraying program to control filariasis transmission by destroying its mosquito vectors on St. Croix, Virgin Islands, are discussed. The medical and entomological phases of the program were carried out by the staff of the School of Public Health, Columbia University, and are reported in the article which follows. The residual spraying was under the direction of the Communicable Disease Center of the Public Health Service, San Juan, Puerto Rico. —Author's Summary.

Editor's note: The following is quoted from the article: "Based on experience in operating the program to date, the following recommendations for continued operations are indicated:

1. Use a spray crew consisting of one foreman and two sprayers.

2. Make two complete sprayings of the island each year.

3. Use new transportation: the time lost in maintaining old trucks is considerable. The remoteness of the island makes mechanical failures difficult to remedy.

4. Most of the houses on the island are poorly constructed and about 80 percent have absorbent interior surfaces. Therefore, 50 percent wettable DDT, since it is applied in particulate form, may be more suitable than solutions or emulsions, and its effectiveness should be determined. Modification of present equipment or the securing of new equipment which would be suitable for applying water suspensions would be necessary." (St. Croix is approximately 21 miles long with a maximum width of 6 miles, and a total area of 84 sq. miles.)

FILARIASIS CONTROL BY DDT RESIDUAL HOUSE SPRAYING, ST. CROIX, VIRGIN ISLANDS. II. RESULTS. By H. W. Brown, and R. W. Willliams. Pub. Hlth. Repts. 64(27):863–875. 1949. The control of *Wuchereria bancrofti* by a DDT spray program of human habitations over a 21-month period was carried out on the island of St. Croix, Virgin Islands, with the following results:

1. The population of *Culex quinquefasciatus,* the vector of filariasis, was reduced approximately 50 percent in the houses.

2. The number of houses in which *C. quinquefasciatus* could be found was reduced by 57 percent.

3. There was a 50 percent reduction of *C. quinquefasciatus* containing forms of *W. bancrofti* which had advanced in development beyond the exsheathing of the microfilariae.

4. Beforе the spray program, 0.40 percent of all *C. quinquefasciatus* examined harbored infective stages of *W. bancrofti.* After the spray program, not a single infective-stage larva was found in any mosquito.

5. *Aedes aegypti* was completely eliminated from the houses.

6. The *W. bancrofti* infection rate in school children dropped from 13.3 percent to 10.6 percent during the spray program, and the average microfilaria count fell from 74.1 per 0.04 ml. of

blood to 45.8. The differences are not quite statistically significant by conservative criteria.

7. Of 504 children examined in 1946 and again in 1948, a total of 454 were negative both times. Twenty individuals experienced increases in microfilaria counts, averaging 14 per 0.04 ml. of blood, while the counts of 30 individuals decreased an average of 46 per 0.04 ml. during the spray period. —Author's summary.

MOSQUITO CONTROL OF RICHLAND, WASHINGTON, IN VIEW OF OPERATIONS OF 1948. Released by the Mosquito Control Committee Representatives of the Atomic Energy Commission, Medical, Transportation, Labor and Community Management Divisions of the Hanford Workers.

A pictorial report with some dozen pages of pictures illustrating the mosquito problem encountered in this area with a short statement accompanying each picture relative to their control activity. This report is put together in ideal form for presentation to laymen and to residents of a mosquito district. ONE OF THE BEST THAT I HAVE SEEN TO ENCOURAGE RESIDENT PARTICIPATION IN A MOSQUITO CONTROL PROGRAM, this type of report could well be used as a pattern for conveying your local problems to the residents of your district.—C. T. Williamson, Suffolk County M.C.C., Yaphank, L. I., N. Y.

THE PLACE OF NEW AND OLD INSECTICIDES IN MOSQUITO CONTROL IN NEW JERSEY. By J. M. Ginsburg, D. M. Jobbins, and T. D. Mulhern. Proc. N. J. Mosquito Ext. Assoc. 36:136–143. 1949. The purpose of this paper is to prescribe as well as compare the various older insecticides, pyrethrum and oil, with those more recently developed, D.D.T. and D.D.D. The efficiency of control and its relation to safety as well as the economy of these toxicants are emphasized. In reading this paper, one is assured by the authors that the use of D.D.T. and D.D.D. have found a definite place in the field of mosquito control; however, they do not completely replace the permanent control. There has been and will continue to be research on the new toxicants because of the relative effect on plants and animals as well as humans. D.D.T. larvicides for the various types of control operations are discussed and suggested proportions are also given very completely, yet concisely. The reader can gain some suggestions from these formulas. Residual sprays, catch basin treatment, and pre-breeding treatment of D.D.T. as well as its use as an adulticide are given worthy note.

It is an admitted fact that D.D.T. can be injurious to various members of the animal kingdom when this compound is not properly applied or is used in places of possible injury to man or animals. However, to change the words of the authors of this paper, yet give the same meaning, we now have a rather cheap and efficient compound to aid in temporary mosquito control that we did not have knowledge of before the war. It is cheap as to cost and ease of application, efficient as oil or pyrethrum in its toxic effect on larvae and adults; however, not as toxic as oil for the pupae. Furthermore, D.D.T. has more types and forms of application than the older insecticides. To quote the authors, "Each one serves a useful purpose in mosquito control." Now, it behooves the various Mosquito Control Agencies to follow the suggestions and findings of the New Jersey Experimental Stations and aid them in their four points of further research as follows:

"1. To establish effective D.D.T. formulations for prebreeding treatments.

"2. To improve the penetrating properties of D.D.T. sprays on waters covered with dense vegetation.

"3. To increase the effectiveness of D.D.T. on pupae by the addition of either pyrethrins or synergic compounds.

"4. Improvements in the use of aircraft for effectively depositing required quantities of D.D.T. on large flooded areas, not accessible to ground applications."—P. Bruce Brockway, Jr., Toledo Area Sanitary District, Toledo 12, Ohio.

IMPLICATION OF THE MOSQUITO *Aedes (Stegomyia) africanus* THEOBALD IN THE FOREST CYCLE OF YELLOW FEVER IN UGANDA. By A. J. Haddow, K. C. Smithburn, G. W. A. Dick, S. F. Kitchen, and W. H. R. Lunsden. Ann. Trop. Med. and Parasitol. 42(2): 218–223. 1948. Since 1944 we have suspected that an arboreal mosquito, *Aëdes (Stegomyia) africanus* Theobald, is involved in the transmission of yellow fever among monkeys in Uganda. We have, therefore, made numerous mosquito catches in trees since that year, and we have established large numbers of sentinel rhesus monkeys on platforms in trees in our main study-areas, Bwamba county and the forests near Entebbe.

During September, 1947, a sentinel monkey, stationed in the forest-canopy near Entebbe, became immune to yellow fever. This indicated that the vector of the disease among monkeys in this region must be arboreal in its habits. In December of the same year, a rhesus monkey died 12 days after receiving a single inoculation of a suspension of *A. africanus*, taken in uninhabited forest in Bwamba. A routine test of blood taken before the inoculation had shown the monkey to be non-immune to yellow fever. Blood specimens taken shortly before and immediately after death, on the 12th day following inoculation with the mosquito suspension, contained neutralizing antibody against yellow fever virus. It is concluded that the *A. africanus* were infected with yellow fever virus, and that this species is involved in the forest cycle of yellow fever.—Author's summary.

CATCHES OF BITING DIPTERA IN UGANDA, WITH ANAESTHETIZED MONKEYS AS BAIT. By A. J. Haddow and G. W. A. Dick. Ann. Trop. Med. and Parasitol. 42(3/4):271–277. 1948. 1. Twenty-four-hour catches of biting Diptera, with anaesthetized monkeys as bait, were made in forest in Bwama county and in the Entebbe area, Uganda.

In two cases the catches were made in the forest-canopy only. In the first of these, redtail monkeys *(Cercopithecus nictitans mpangae* Matschie) were used, and in the second "grey" or "grivet" monkeys (*C. aethiops centralis* Neumann). The third catch was made simultaneously in the canopy, at understory level and at ground level, with rhesus monkeys (*Macaca mulatta* Zimmermann) used as bait.

2. In all three catches the most abundant mosquito biting the monkeys was *Aëdes (Stegomyia) africanus* Theo., a species which we know to be involved in the forest cycle of yellow fever in Uganda. Other prevalent species in the forest-canopy were *A. (S) apicoargenteus* Theo. and the tabanid *Chrysops centurionis* Aust., which we suspect to be a vector of filariasis among Uganda monkeys.

3. It is known that, with monkeys used as bait, *A. africanus* and, to a lesser extent, *A. apicoargenteus* form a much larger percentage of the catch than when African catchers, using themselves as bait, are employed. *Taeniorhynchus* spp. and *Anopheles (Myzomyia) gambiae* Giles appear, on the other hand, to attack man more readily than monkeys.

4. It is concluded that *A. africanus* and *A. apicoargenteus* probably feed mainly on monkeys in nature.

5. So far, we have recorded 15 species of mosquitoes and one tabanid *(C. centurionis)* biting monkeys in Uganda. Of the mosquitoes taken biting monkeys in trees an exceedingly high proportion (86 per cent) belong to species which normally breed in tree-holes.—Author's summary.

RECOVERY OF ANOPHELINE EGGS FROM NATURAL HABITATS, AN AID TO RAPID SURVEY WORK. By T. H. G. Aitken. Ann. Ent. Soc. America 41(3): 327–329. 1948. In this short article, the author points out the value of making anopheline egg collections under natural conditions. Immediate specific identifications can be obtained in the field, and a survey can be made of uninhabited regions where adult anophelines are difficult to find. Aitken writes from experience gained during a survey in May–August 1948 at Sardinia, an island lying west of the Italian peninsula, approximately 9,300 sq. miles in area, with most of it at altitudes of about 1,600 ft. or more. Over 9/10 of the population of 1,222,000 live in village centers. The author recommends that ordinary dipper samples be examined for mosquito eggs floating with the debris; these eggs can be readily removed by means of straws or the dried spiky leaves of wire grass *(Eleocharis)*. A tentative identification is made with a 20X hand lens, then the eggs are placed on strips of blotting paper soaked in 2% formalin and stored in small glass vials. In the survey reported, eggs recovered included those of *Anopheles labranchiae, A. melanoon, A. claviger,* and *A. algeriensis.* During the following season, the species incidence was confirmed by other types of collections. The author believes that consideration should be given this technique in other localities, such as in South America, where confirmation of *Nyssorhynchus* species frequently requires examination of the eggs, or in North America, where such studies of the *A. crucians* group might be advantageously undertaken. Because the collection of eggs from algal mats is very easy, the algal mat inhabiting *A. pseudopunctipennis* and its varieties should lend themselves to investigations involving eggs. (Ed. Note: The author may be addressed, Thomas H. G. Aitken, IHD, The Rockefeller Foundation, % ERLAAS, Piazza Garibaldi, Cagliari, Sardinia, Italy.)

—H.L.T.

A MALARIA RECONNAISSANCE OF THE STATE OF VERACRUZ, MEXICO. By José Bustos Castellanos, Lázaro Cerdán Murrieta, Guenther Lassman, and Carmen Ortiz. Am. Journ. Trop. Med. 29(1):23–35. 1949. A malaria reconnaissance of the State of Veracruz was conducted during 1944–46. Veracruz lies along the Gulf Coast of Mexico for about 960 kilometers (597 miles) with a width varying from 47 to 212 kilometers (29 to 131 miles). Most of the area is hilly or mountainous. The paper contains maps showing altitude, temperature, and rainfall zones. History, population, economy, and vital statistics are discussed briefly; and procedures of the malaria survey are given in detail. Although malaria is a serious problem, the State as a whole "can be considered as a zone of moderate malaria endemicity." There is less malaria at altitudes exceeding 1,000 meters (about 3,280 ft.). The incidence of *vivax* malaria increases with the altitude, while that of *falciparum* drops. A total of 45,949 Anophelines in 1,068 collections, was obtained. Species found were: *Anopheles albimanus, A. pseudopunctipennis, A. argyritarsis, A. punctimacula, A. apicimacula, A. neomaculipalpus, A. eiseni, A. vestitipennis, A. parapunctipennis, A. quadrimaculatus, A. strodei, A. crucians,* and *A. (Chagasia) bathanus. Albimanus* is probably the principal malaria vector, with *pseudopunctipennis* and *quadrimaculatus* also of importance.—H.L.T.

THE DEVELOPMENT AND PRACTICES OF THE ANTI-MALARIA CAMPAIGN IN ARGENTINA. Silvetti, Luis A., Inter-American Association of Sanitary Engineering, Vol. 2, No. 1, July, 1948. Three malarious areas exist in Argentina, two of which (northeast and west-central zones) are endemic, the other (Littoral Zone) being epidemic. *Anopheles pseudopunctipennis* is the sole vector in the endemic area and it exists as the only anopheline in arid Argentina. The vector/s has not yet been determined in the Littoral Zone, although *A. albitarsi* and *A. darlingi* are suspected.

The nature of anopheline control performed is dependent upon the human population density. Cities and the more important towns are protected principally by larval control. DDT house spraying for adult mosquito control is carried on in suburban and rural areas (and also in some cities of 5,000 to 15,000 population).

The anti-larval program utilizes knowledge of *A. pseudopunctipennis* ecology and its objective is to eliminate mosquito breeding areas where possible. A balanced combination of mechanical, chemical and biological measures is characteristic.

Adult control lends itself because of the domestic and anthrophilic habits of *A. pseudopunctipennis*. This is accomplished by DDT residual spraying of houses. Spraying is confined to living rooms and sleeping rooms. Retreatment is practiced at three-month intervals during the mosquito season.

Although it is not yet possible to fully evaluate the results of the program, house collection records show that adult anophelines have decreased markedly. The blood parasite index for *Plasmodium falciparum* has shown drastic reduction and dispensary cases have dropped appreciably.

The overall impression of the program received by the reviewer is that a maximum of resourcefulness is being applied to the problem with the resources available. It is hard to appreciate why crude oil should be used for weekly larval treatments when aqueous (emulsible) DDT could be substituted. It is also wondered why aqueous (emulsible) DDT is not substituted for much of the use of DDT in kerosene for residual adult control. No mention of the use of space sprays (fogs, aerosols, etc.) is made nor is the use of the airplane in applying aerosols indicated. Perhaps these approaches could supplement the program in places. A last wonder is whether entomological services in evaluating the program are being utilized to maximum advantage.—Richard F. Peters, Bureau of Vector Control, State Dept. of Health, Berkeley, California.