REVIEWS AND ABSTRACTS

MOSQUITOES OF NORTH AMERICA. Carpenter, S. J. and LaCasse, W. J. 1955. Berkeley, Calif. University of California Press. 360 pp. $10.00. The amount of good, sound information concentrated in this one volume is impressive. We cannot resist the impulse to compare the wealth of information found in this one book with that available in several publications twenty, or even five years ago.

The first 7½ pages outline the life history of mosquitoes, the method of collecting adults, larvae, and eggs, and the preparation of specimens for study. This is followed by 15 pages on external anatomy and 1½ pages on internal anatomy. The next 305 pages are devoted to descriptions and keys to subfamilies and tribes and to the eleven genera and 143 species and subspecies found in North America north of Mexico. Under each species is a list of synonyms, descriptions of the female, male, and larva, and paragraphs on geographical distribution, bionomics, and on medical importance. With a few exceptions, each species is illustrated by line drawings of the male terminalia, and by one of larval characters, including in apparently every instance the larval terminal segments and head, comb scale and pecten tooth, and sometimes the thorax. Pupae are not keyed or described.

The excellent drawings are an outstanding part of the book; they are a stimulus to the student of taxonomy and an encouragement to the specialist in other fields of culicidology. Two of the text figures were taken from publications by Ross and Roberts and by Penn, others from the 1946 monograph by Carpenter, Middlekauff, and Chamberlain, and the remainder were drawn by members of the Taxonomic Entomology Section of the 406th Medical General Laboratory in Japan, and by Eustorgio Mendez and Reginald Jones. Full-page plates of the females of 127 species are found at the end of the book. They were drawn by Saburo Shibata, Kei Daishoji, and Kakuzo Yamazaki, also of the Taxonomic Entomology Section in Japan.

The geographical distribution of species is listed by state and by Canadian province, and the data are well-documented.

It should be remembered that the value of this work lies in its authoritative presentation of facts for mosquito identification, and that the bionomics and medical importance of the species are, with a few exceptions, treated briefly. The authors have provided a splendid bibliography, including numerous references for specialists in fields other than taxonomy. We recommend that the bibliography of 770 titles be read as carefully as the text.

The systematic index is arranged so that valid genera and subgenera appear in bold type, valid species in roman, and synonyms in italics. This is helpful, not only to the student, but to the worker preparing manuscript. Indeed, we could have used a similar guide to world species during the compilation of AMCA Bulletin No. 3!

This is a large book, approximately 9 by 11 inches, but it is thin enough, 1½ inches, to fit into a crowded briefcase; and it is lightweight enough to be carried in the field. Its strong, well-printed pages and sturdy binding should give years of good service; and its concise, comprehensive contents merit its placement on the shelves of every office or laboratory where mosquitoes or mosquito-borne diseases are being investigated.—H. L. T. D.

THE MOSQUITO FAUNA IN SELECTED SWAMP AREAS AT THE PATUXENT RESEARCH REFUGE, MARYLAND IN 1955. Joseph T. Whitlaw, Jr. Unpublished M.S. Thesis, University of Maryland. 38 pp. 1956.

Two similar swampy areas on the Patuxent Research Refuge were studied from April to November, 1955 to determine their mosquito fauna. The fourteen acre check area would remain unimpounded. Plant species are designated with observations on relative abundance. Each week larval populations were estimated by dipping; 1,421 larvae were taken in 2,100 dips in the study area; 284 larvae were taken in 280 dips in the check area. Adult populations were estimated by recording the number landing on the author in stated periods. Nocturnal biting collections were made also. An estimated total number of 425 adults were collected during 287 minutes in the study area, while 46 adults were collected during 35 minutes in the check area. Stations in the areas were designated to insure an adequate sample. Precipitation data are given.

The three species of larvae collected, listed in order of abundance, in the study area were: *Aedes canadensis* (Theobald), *Culex territans* Walker, and *Aedes vexans* (Meigen). In order of abundance, the six species of larvae dipped in the check area were: *Aedes canadensis, C. territans, Anopheles punctipennis* (Say), *Aedes vexans, Anopheles crucians* Wiedemann, and *C. restuans* Theobald. The ten species of adults collected in the study area listed in order of abundance were: *Aedes canadensis, Aedes vexans, Psorophora ferox* (Humboldt), *Aedes trivittatus* (Coquillett), *Mansonia perturbans* (Walker), *Anopheles punctipennis, Aedes triseriatus* (Say), *C. pipiens* Linnaeus, *C. salinarius* Coquillett, and *P. ciliata* (Fabricius). In order of abundance, the nine species of adults collected in the check area were: *Aedes vexans, P. ferox, Aedes trivittatus, Aedes canadensis, Anopheles punctipennis, Aedes triseriatus, M. perturbans, Aedes sollicitans* (Walker), and *C. restuans.*

Larvae of *Aedes canadensis* were found on three separate occasions in the same station following the drying up of the station. After these drying periods, of varying time lengths, the station was thrice inundated and found to contain larvae of this species.

An increase in larval production followed torrential rains during August, 1955. Prior to these downpours the areas were nearly dry, and larval production had fallen to zero.

Collectively, because of the large acreage they occupy on the Refuge, swamp areas such as those studied probably constitute important sites for mosquito breeding. Outside the swamps mosquitoes were not particularly annoying, and this fact would seem to indicate that the dispersal range of the mosquitoes breeding in the swamps was not great.—Wm. E. Bickley.

THE ATTRACTIVENESS OF SIX MAMMALS TO MOSQUITOES AT THE PATUXENT RESEARCH REFUGE IN THE SUMMER OF 1955. Neville Karunasena Rajapaksa. Unpublished M.S. Thesis, University of Maryland. 37 pp. 1956.

Six different species of mammals were used as bait to attract mosquitoes, at the Patuxent Research Refuge, Laurel, Maryland, in the summer of 1955. The traps used were designed by Captain Donald L. Price of the United States Army Medical Service and were a modification of the type used by Magoon in 1935.

The traps were located in two widely separated wooded areas on the Refuge. A total of 124 specimens belonging to eight species were represented in the catches. *Aedes triseriatus* Say., *Aedes vexans* Meig., and *Psorophora ferox* Hum. were the dominant species. Also collected were *Aedes canadensis* Theo., *Anopheles crucians* Wied., *Anopheles punctipennis* Say., *Mansonia perturbans* Walker, and *Culex pipiens* L.

Aedes triseriatus was not collected at night confirming previous reports that this species is crepuscular. *Psorophora ferox* was collected from August 11th to September 3rd.

There was no significant difference between the attractiveness of the raccoon, woodchuck, skunk, possum, and squirrel to the mosquitoes known to be present. The rabbit was found to be significantly less attractive than the other mammals.

Details of numbers and species of mosquitoes attracted to each mammal are given. Each animal was exposed for six 24-hour periods. The experiments were conducted from July 17 to September 6, 1955.—Wm. E. Bickley.

AN ECOLOGICAL STUDY OF THE MOSQUITOES OF SNOWDEN POND, PATUXENT RESEARCH REFUGE, MARYLAND. Richard A. Boettcher. Unpublished M.S. Thesis, University of Maryland. 35 pp. 1956.

The mosquito fauna of Snowden Pond was studied from November 1954 to November 1955. The seven and one-half acre impoundment was completed in 1947. Descriptions are given of the types and abundance of vegetation. Dipping was carried out at weekly intervals at twenty-six designated stations. Larval collections were supplemented with light-trap and biting collections. Water level fluctuations were recorded.

A total of 2,190 mosquito larvae were collected during the course of 14,617 dips. Species dipped, listed in their order of abundance were *Aedes canadensis* (Theobald), *Culex restuans* Theobald, *Anopheles* spp., *Culex* spp., *Culex erraticus* (Dyar & Knab), *Culex territans* Walker, *Anopheles crucians* Wiedemann, *Uranotaenia sapphirina* (Osten-Sacken), *Anopheles punctipennis* (Say), and *Anopheles quadrimaculatus* Say. *Aedes canadensis* is recorded for the first time from a fresh-water impoundment. Larvae of this species, which constituted 58 percent of the total, were dipped most often in small pockets at or near the head of the pond. Eggs may have been washed down with debris from wooded slopes.

Culicine larvae were collected most frequently in small marginal pools, while anopheline larvae were dipped most often in thick stands of emergent vegetation.

A rise in water level was found to be conducive to increased larval production. A two-weeks time lag usually occurred between the rise in water level and the rise in larval population.

Snowden Pond was not found to be an important source of pest mosquitoes.—Wm. E. Bickley.

THE SALINITY TOLERANCE OF FOUR SPECIES OF MOSQUITO LARVAE WITH SPECIAL REFERENCE TO THE LENGTH OF THE ANAL PAPILLAE. Michele Williams. Unpublished M.S. Thesis, University of Maryland. 42 pp. 1952.

Twelve solutions were used in which amounts of calcium and magnesium sulfates were kept constant but sodium chloride varied. The maximum salinity in which *Culex pipiens* L. could exist was 1.35 percent sodium chloride; *Aedes aegypti* L., 1.00 percent; *Culex restuans,* Theo., .85 percent; *Aedes atropalpus* Coq., .60 percent.

Culex pipiens larvae reared in 1.25 percent sodium chloride had anal papillae approximately one-fourth the length of those reared in distilled water. An extreme reduction in length of papillae of *C. restuans* occurred above .50 percent. *Aedes atropalpus* showed a progressive but not striking reduction up to .50 percent. Papillae of *A. aegypti* in .05 percent sodium chloride were about half the length of those in distilled water but did not become shorter in higher concentrations.

Confirmation is given to the view of Koch and Wigglesworth regarding the function of "anal gills." Larvae of *A. aegypti* had the same limit of tolerance for potassium chloride as for sodium chloride. The anal gills of *C. pipiens* and *C. restuans* behave in a similar manner.

An "overcrowding" effect in distilled water may shorten the anal gills of *A. aegypti* in a similar manner as dissolved salts.

Lethal concentrations of salt for fourth instar larvae of the four species are given.

The pupae of six species of mosquito larvae seem to be independent of the salinity of the water and will transform to adults in water containing up to 3.00 percent sodium chloride.—Wm. E. Bickley, University of Maryland, College Park, Md.

THE AMINO ACIDS REQUIRED FOR EGG PRODUCTION IN *Aedes aegypti*. By J. B. Dimond, A. O. Lea, W. F. Hahnert, Jr., and D. M. DeLong. Canad. Ent. 88 (2): 57-62. 1956. Four day old *Aedes aegypti* females, which fed on 10 percent glucose, were offered various combinations of amino acids on pads of cotton in groups of 400. The number of eggs laid over a 14 day period were counted and the various diets then compared.

Under these conditions the following 11 amino acids were found to be essential for a high level of egg production: (1) arginine, (2) *l*-isoleucine, (3) *l*-leucine, (4) lysine, (5) *l*-phenylalanine, (6) *l*-threonine, (7) *l*-tryptophane, (8) *l*-valine, (9) *l*-histidine, (10) *l*-methionine, and (11) cystine. No eggs were produced when any one of the first 8 amino acids was omitted from the diet. D-histidine was as effective as the *l*-isomer. But *d*-isomers of methionine, phenylalanine, and tryptophane were not as good as the *l*-forms. The *d*-isomers of isoleucine, leucine, threonine and valine were apparently non-usable forms. The five amino acids not essential to egg production were (1) alpha alanine, (2) aspartic acid, (3) proline, (4) serine, and (5) tyrosine.

The authors state that ". . . at an equivalent nitrogen level, blood is a poor medium for egg production as compared to amino acid mixtures."

A major finding is that the qualitative amino acid requirements for egg production are essentially the same as those necessary for larval growth.

What part, if any, bacterial contamination (deamination) of the diets may have played in this study is hard to evaluate. Presumably the mixtures were contaminated by bacteria able to alter the composition of the diets. No indication is given as to whether the mosquitoes fed equally well on all mixtures. Especially in cases where no eggs were laid this information seems desirable. A comparison between the numbers of viable females over the two week testing period is not given, but presumably they are approximately equal.—Jack Colvard Jones, National Institutes of Health, Bethesda, Md.