NOTES ON THE OPERATION OF A LIGHT TRAP IN CENTRAL LUZON, PHILIPPINE ISLANDS

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A mosquito survey of Clark Air Force Base, Pampanga, Luzon, P.I., was initiated in August 1963. This report covers collections from a mosquito light trap (New Jersey type) from 18 August 1963 through 7 July 1964. Mosquito collections were studied with the following objectives: (1) To ascertain seasonal distribution; (2) to determine nocturnal flight habits between the hours of 6:00 p.m. and 10:00 p.m.; (3) to find out what species were attracted to light in the area and their relative abundance; and (4) to evaluate adult mosquito control measures. Information pertaining to the first 3 of these objectives is presented below.

The trap was located near a residence in the center of a family housing area on the west side of the base. The area was approximately 1200 yards from any well defined "off" base breeding area and was subjected to periodic insecticidal fogging operations. The trap was operated at least 12 nights per month except July when it was operated six nights.

Mosquitoes were captured every month of the year and appeared to follow a seasonal pattern except for a sharp increase in March (Fig. 1) due to the sharp influx of a single species: *Anopheles subpictus indefinitus*. The rainy season in central Luzon generally begins toward mid-June and continues until late September. The heaviest monthly rainfall during the study was in September, when 20.15 inches were recorded at the local weather station. October through February is the warm-dry season and March through May the hot-dry season. During March there are occasional heavy rain showers that occur along the foothills. These showers are spotty and are often not recorded, but may contribute to heavy local mosquito breeding. This probably accounts for the increase in mosquito activity in March.

A total of 6393 mosquitoes were identified of which 83 percent were females. Of the 16 genera and 244 species of mosquitoes reported from the Philippines (Delfinado, 1962), 7 genera (44 percent) and 42 species (17 percent) were represented in the total collection. *Culex* species comprised 51 percent of the total catch and *Anopheles* species 46 percent.

Of the 36 reported species, sub-species and varieties of *Anopheles* from the Philippine Islands, 11 (30 percent) were collected in the trap. *Anopheles subpictus indefinitus* (Ludlow) was the most abundant species collected (52 percent). *Anopheles vagus limosus* King (35 percent), and *Anopheles peditaeniatus* (Leicester) (7 percent), were the next two species most frequently collected. *Anopheles minimus flavirostris* (Ludlow), considered to be the primary vector of malaria in the Philippines, was not collected in the light trap although it was present in the area. This tends to support the findings of Thurman (1955) in Thailand who failed to collect this mosquito in light traps. One specimen of an undetermined species of *Anopheles* was collected. The specimen did not agree with any of the southeast Asia species placed in the *umbrosus* group nor did it match any described Oriental species (Stone, 1964). Other species of *Anopheles* comprising 6 percent of the total are listed under the heading: *Species of Mosquitoes Collected.*

Of the culicines captured, the genus *Culex* accounted for 95 percent of the total. *Culex fuscocephalus* Theobald (49 percent) was the most abundant, followed by *Culex tritaeniorhynchus summorosus* Dyar (37 percent), and *Culex whitmorei*

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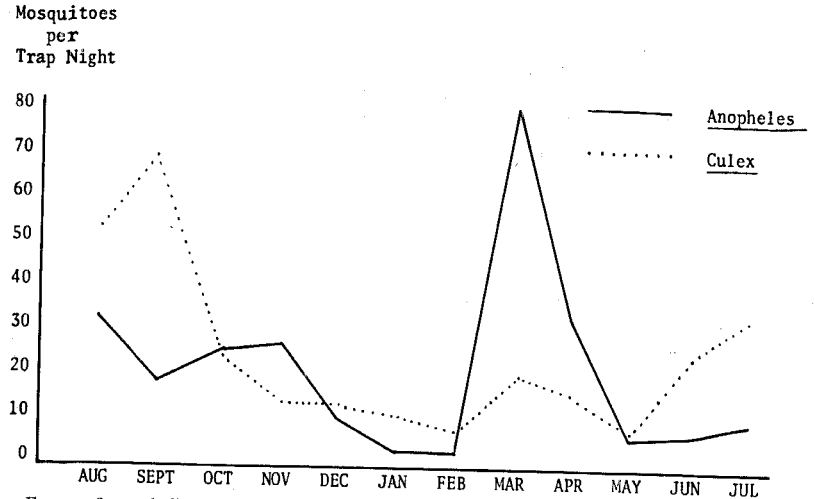

FIG. 1.—Seasonal distribution of *Anopheles* and *Culex* species in Central Luzon, P.I. Data from light trap collections, 1963–64.

(Giles) (11 percent). Other *Culex* comprising 3 percent of the total are listed in order of abundance under species collected.

The presence of *Culex tritaeniorhynchus summorosus*, in considerable numbers, is of interest in that this species is considered to be a primary vector of Japanese encephalitis virus (JEV) in many areas of Asia. The role of *C. t. summorosus* in the transmission of JEV in the Philippines is unknown. This mosquito was collected every month of the year with the highest peak during the summer rainy season. A smaller peak occurred in March and April of the hot-dry season (Fig. 2).

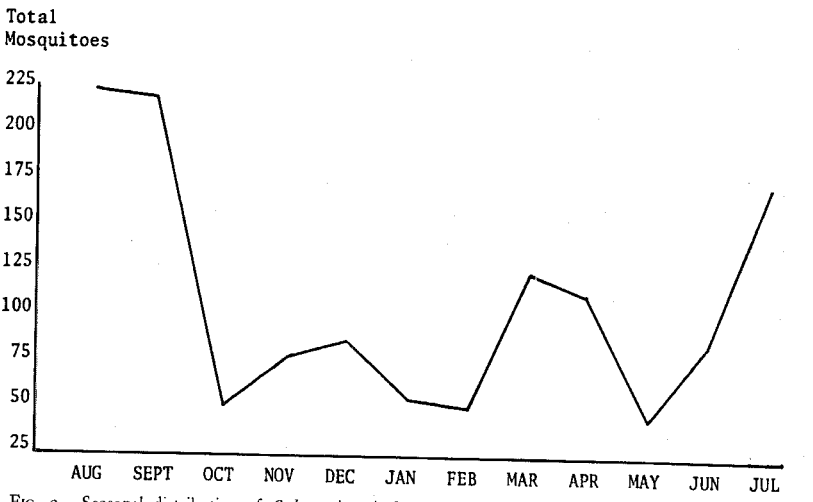

FIG. 2.—Seasonal distribution of *Culex tritaeniorhynchus summorosus* in Central Luzon, P.I. Data from light trap collections, 1963–64.

Aedes vexans nocturnus (Theobald) was the most common *Aedes* collected and accounted for 87 percent of the total. Other *Aedes* collected are listed in order of abundance. Other culicines were collected in smaller numbers and are listed under species collected.

On 24 occasions the evening flight activities of the mosquitoes were studied by operating the trap hourly between 6-10 p.m. Sixty-two percent of the three most common species of *Culex* collected were taken between 6-8 p.m. and 87 percent between 6-9 p.m. *C. t. summorosus* was the only species that showed a steady decrease from a high in the 6-7 p.m. period. The other species considered (Fig. 3) reached a peak between 7-8 p.m. and decreased from that point. Of the three most common species of *Anopheles* taken, 56 percent were captured between 6-8 p.m. *A. vagus limosus* was rather uniformly active throughout the 6-10 p.m. period, while 78 percent of *A. pediaeniatus* were taken between 6-8 p.m. and 91 percent between 6-9 p.m. (Fig. 4).

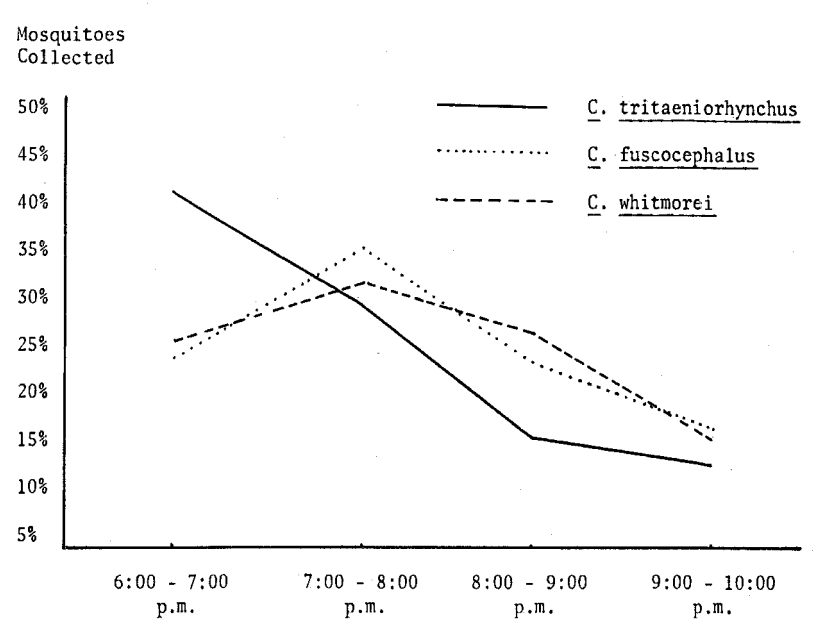

FIG. 3.—Hourly percentage catch of three species of *Culex* in Central Luzon, P.I. Data from light trap collections, 1963-64.

Species of Mosquitoes Collected. The genera are arranged in alphabetical order with the species listed in order of abundance captured.

Aedeomyia catasticta

Aedes: *vexans nocturnus* (Theobald), *lineatopennis* (Ludlow), *poecilus* (Theobald), *albopictus* (Skuse), *flavipennis* (Giles), *vigilax ludlowae* (R. Blanchard), *pampangensis* (Ludlow), (*Stegomyia*) spp.

Anopheles: *subpictus indefinitus* (Ludlow), *vagus limosus* King, *peditaeniatus* (Leicester), *ludlowae,* (Theobald), *annularis* Van der Wulp, *Anopheles* spp., *pseudosinensis* Baisas, *maculatus* Theobald, *filipinae* Manlang, *barbirostris* Van der Wulp, *baezai* Gater.

Culex: *fuscocephalus* Theobald, *tritaeniorhynchus summorosus* Dyar, *whitmorei* (Giles), *Culex* spp, *gelidus* Theo-

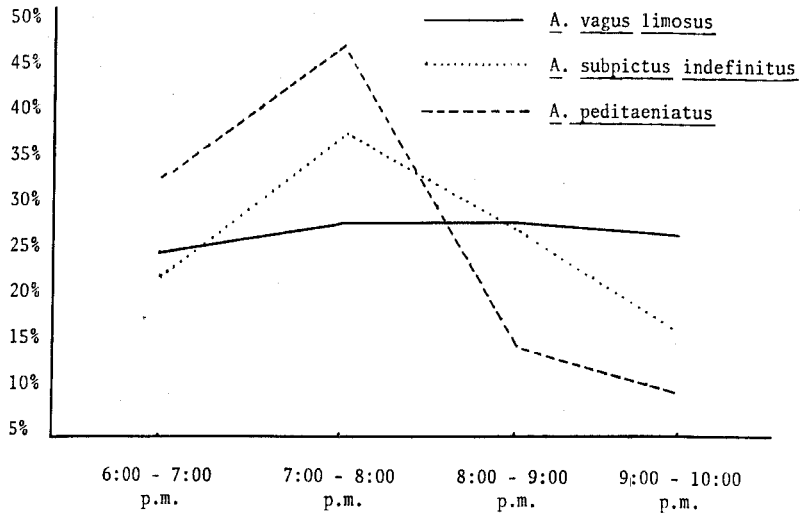

FIG. 4.—Hourly percentage catch of three species of *Anopheles* in Central Luzon, P.I. Data from light trap collections, 1963–64.

bald, *sitiens* Wiedemann, *annulirostris* Skuse, (*Lophoceraomyia*) spp., *pipiens quinquefasciatus* Say, *bitaeniorhynchus* Giles, *fuscanus* Wiedemann.

Ficalbia luzonensis (Ludlow)

Mansonia: *uniformis* (Theobald), *mansonia* spp., *ochracea* (Theobald), *annulifera* (Theobald).

Uranotaenia: *testacea* Theobald, *obscura* group Edwards, *uranotaenia* spp., *arguellesi* Baisas, *lagunensis* Baisas, *tubanguii* Baisas.

SUMMARY: During a mosquito survey of Clark Air Base, Pampanga, Luzon, Philippine Islands, a New Jersey type light trap was operated for a period of one year. Of the 16 genera and 244 species of mosquitoes reported from the Philippines, seven genera and 42 species were collected in the trap. Fifty-one percent of the mosquitoes collected were *Culex* species and 46 percent *Anopheles* species. The three most common *Anopheles* collected were *A. subpictus indefinitus* (Ludlow), *A. vagus limosus* King and *A. peditaeniatus* (Leicester). *A. minimus flavirostris* (Ludlow), a primary vector of malaria in the Philippines, was not collected in the light trap. One specimen of *Anopheles* unlike any described Oriental species was collected.

The most abundant *Culex* species were *C. fuscocephalus* Theobald, *C. tritaeniorhynchus summorosus* Dyar and *Culex whitmorei* (Giles). Other genera and species were collected in lesser numbers and are tabulated.

Evening flight activities of mosquitoes showed that most were collected between 6–8 p.m. *Culex tritaeniorhynchus summorosus,* a probable vector of Japanese encephalitis virus in the Philippines, appeared to be most active between 6–7 p.m.

The most mosquitoes per trap night were collected during March of the hot-dry season. This can be explained by the tremendous increase of *Anopheles subpictus indefinitus* during this period. With the exception of this one *Anopheles* the mosquito population was heaviest during the rainy season (July-Sept). Culicine populations peaked during September, the month of heaviest rainfall. Anopheline populations declined during that period. Lowest mosquito activity was in the months of January, February and May.

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LARVAL DIFFERENCES BETWEEN *AEDES COMMUNIS* (DeG.) AND *A. IMPLICATUS* VOCK., (DIPTERA:CULICIDAE) [1] IN A COLORADO COMMUNITY

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In the East River Valley area of the Gunnison National Forest of Colorado, in the vicinity of the Rocky Mountain Biological Laboratory at Gothic (alt. 9500 ft.), 9 miles north of Crested Butte, *Aedes implicatus* Vock. (the *impiger* of earlier authors, not of Walker-Vockeroth, 1954), occurs in numbers along with the more abundant and widely distributed *A. communis* (DeG.). Since larvae of the two species are very similar, a careful study was necessary to find characters helpful in distinguishing them in their various instars.

The larvae of *A. implicatus,* occurring in June through early July, according to the season, were almost invariably found in association with *A. pullatus* (Coq.), in small shallow pools left by receding stream waters and shaded by willow thickets, often with some running water feeding them. *A. communis,* although frequently associated with *implicatus* in these pools, was found in greatest abundance in almost pure cultures in rather deep semi-permanent pools in spruce forest, where *implicatus* was never collected. The emergence of *implicatus* adults paralleled that of *communis,* occurring after that of *A. cataphylla* and prior to the peak emergence of *A. pullatus.* Biting adults were captured through early August, and, like *communis,* were with only few exceptions taken in shaded areas adjacent to their breeding places.

FIELD CHARACTERS—SIZE, HEAD COLOR, GILL LENGTH. The *implicatus* larva could usually be distinguished from *communis* by the smaller size of the mature larva (not larger than the average third instar *communis*), by its uniformly dark head (lighter brown with dark sutures in *communis*), and by its generally shorter gills. In the *implicatus* larvae examined, the gills were frequently less than the saddle length, and usually less than twice as long, although a paratype series specimen from Norman Wells, N. W. T., loaned by Dr. J. R. Vockeroth, had gills more than three times the saddle length. In *communis,* the gills were usually at least twice the saddle length, and frequently three or more times as long. That the length of the gills of various species is influenced by the amount of dissolved salts in the water has been repeatedly demonstrated. (The author has collected larvae of *A. punctor* Kby. with gills more than twice the normal length, from a small rocky

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