

OBSERVATIONS OF FIRE BARREL BREEDING MOSQUITOES IN THE PHILIPPINES

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INTRODUCTION. This study was initiated because of observations of sharp fluctuations in mosquito populations since August 1963, in fire barrels located on Clark Air Base. At that time the fire barrels contained *Aedes (Stegomyia) albopictus* (Skuse) almost to the exclusion of all other mosquitoes. No *Aedes (Stegomyia) aegypti* (Linnaeus) were observed breeding in this habitat. In a 1957 comprehensive survey including the base and adjacent areas, only 20 *A. aegypti* were collected

among a total of 28,379 mosquitoes (Dowell, 1958). In August 1964, it was observed that the mosquito fauna from these barrels consisted primarily of *A. aegypti*. It was evident that a major change in fauna distribution had taken place. It was desirable, therefore, to study the distribution and abundance of mosquito fauna in the ensuing months.

METHOD. From August 1964 through April 1965, larval collections were made from seven fire barrels of 55-gallon capacity at weekly intervals in conjunction with a resurvey of Clark Air Base (Dowell, 1965). All fire barrels were located within a radius of 50 yards from one another in Negrito Village, an area housing civilian guards and their families of Aus-

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traloid pygmy origin. This village is in the northeast portion of the base, well removed from other inhabited areas. Clark Air Base is located in Pampanga Province adjacent to Angeles City, about 60 miles north of Manila.

No attempts were made to alter the normal use of these barrels except to see that they contained water and to occasionally remove excess debris. Some of the barrels were partially covered but this did not exclude mosquitoes. A standard measure of ten dips per barrel was made using a one-pint capacity white enamel dipper. No attempts were made to correlate the differences between barrel waters as to pH, turbidity, or amount of organic matter. The water differed considerably between barrels and these differences changed quite often. The water varied from clear to extremely turbid as the water barrels were sometimes used as garbage cans and debris collectors.

The nomenclature of Stone, Knight, and

Starcke (1959) is used throughout this paper.

RESULTS. Table 1 lists the mosquito species and number of larvae of each species collected from each fire barrel. When compared with the information above, it is apparent that the mosquito fauna had undergone sharp changes. Of the nine species of mosquitoes collected, only the first four were of numerical significance. Both *Culex* (*Lutzia*) *fuscanus* (Wiedemann) and *Toxorhynchites splendens* (Wiedemann) are voracious predators and were found only in association with large numbers of other mosquitoes. While Horsfall (1955) does not mention any records of *A. peditaeniatus* or *A. vagus limosus* from artificial containers, specimens of each species were taken from our fire barrels.

Fire barrels 1 through 3 had over 76 percent of the specimens collected. Barrels 1 and 3 yielded only three species each, whereas the others had at least five

TABLE 1.—Abundance of mosquitoes by species in fire barrels.

Species ^a	Fire barrel number							Totals
	1	2	3	4	5	6	7	
<i>C. pipiens</i> ssp. <i>quinquefasciatus</i> Say	1725	275	1626	159	811	257	308	5161
<i>A. aegypti</i> (Linnaeus)	938	1715	116	184	15	99	39	3106
<i>A. albopictus</i> (Skuse)	79	42	17	11	4	1	1	155
<i>C. fuscanus</i> Wiedemann	0	0	0	9	47	18	5	79
<i>C. nigropunctatus</i> Edwards	0	1	0	21	0	0	0	22
<i>C. fuscocephalus</i> Theobald	0	8	0	3	2	0	0	13
<i>An. peditaeniatus</i> (Leicester)	0	0	0	10	1	1	1	13
<i>An. vagus</i> ssp. <i>limosus</i> King	0	0	0	0	0	0	2	2
<i>T. splendens</i> (Wiedemann)	0	0	0	0	2	0	0	2
Totals	2742	2041	1759	397	882	376	356	8553

^a C. represents *Culex*; A., *Aedes*; An., *Anopheles*; and T., *Toxorhynchites*.

TABLE 2.—Distribution of species by month (1964-65).

Species ^a	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Totals
<i>C. pipiens</i> ssp.										
<i>quinquefasciatus</i>	276	19	251	1429	533	1334	5	991	323	5161
<i>A. aegypti</i>	1847	274	450	217	255	63	0	0	0	3106
<i>A. albopictus</i>	88	2	13	7	44	0	1	0	0	155
<i>C. fuscans</i>	21	5	17	35	1	0	0	0	0	79
<i>C. nigropunctatus</i>	0	0	0	21	1	0	0	0	0	22
<i>C. fuscocephalus</i>	0	8	3	0	2	0	0	0	0	13
<i>An. peditaeniatus</i>	0	0	12	1	0	0	0	0	0	13
<i>An. vagus</i> ssp. <i>limosus</i>	0	0	0	2	0	0	0	0	0	2
<i>T. splendens</i>	0	0	2	0	0	0	0	0	0	2
Totals	2229	308	748	1715	836	1397	6	991	323	8553

^aC. represents *Culex*; A., *Aedes*; An., *Anopheles*; and T., *Toxorhynchites*.

species with barrels 4 and 5 yielding seven species apiece.

An analysis of variance of the data presented in Table 1 showed that there is a highly significant difference in numbers of a species present in the fire barrels at the 99.5 percent level of confidence ($F=5.59$). That is, numbers of a species were

not evenly distributed among the fire barrels.

Table 2 and Figure 1 illustrate, numerically and graphically, respectively, the changes that occurred by month over the course of this study. The distribution of *C. pipiens* was low in August and September when the *A. aegypti* population was

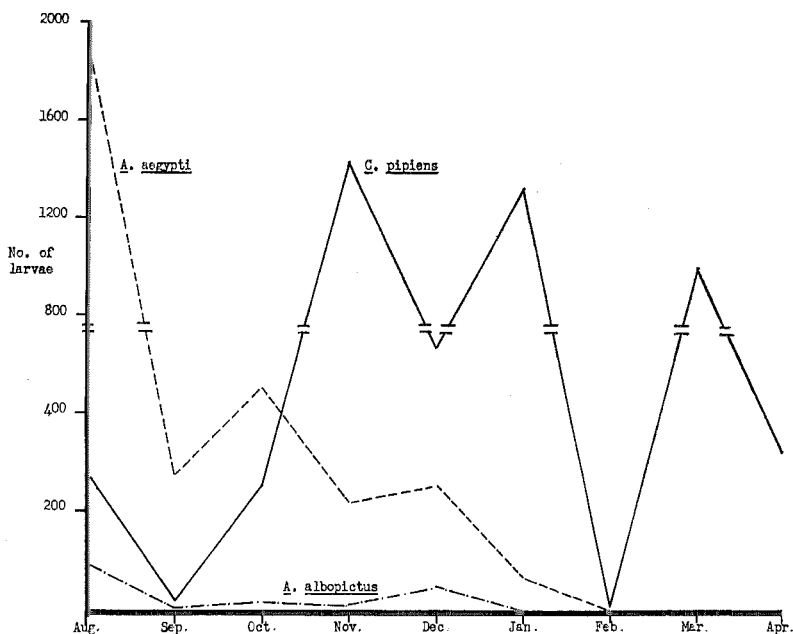


FIG. 1.—Number of specimens by species by month.

very high. *C. pipiens* increased thereafter having high peaks in November, January, and March.

Of the 8,553 specimens collected, *C. pipiens* and *A. aegypti* accounted for 8,267 or 96.7 percent. The collections for February, March, and April, but for one specimen of *A. albopictus*, consisted entirely of *C. pipiens*. From the above and personal observations in 1963 of *A. albopictus* and early 1964 of *A. aegypti*, it was evident that *C. pipiens* had taken over this "ecological niche" from the other species inhabiting these fire barrels.

SUMMARY AND CONCLUSIONS. Over the past two years, sharp fluctuations in mosquito populations of fire barrels were observed. In 1963, *A. albopictus* was the most plentiful species. *A. aegypti* replaced *A. albopictus* some time in late 1963 or early 1964. In the late summer of 1964, *A. aegypti* populations were at their peak, but gradually receded to zero. *C. pipiens* thereafter became the dominant species. The difference between numbers of a species is highly significant. Small num-

bers of *A. peditaeniatus* and *A. vagus limosus* were recovered from artificial containers.

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References Cited

DOWELL, F. H. 1958. Interim Report on the Joint Thirteenth Air Force—Department of Health, R. P., Mosquito Survey of Clark Air Base, Report 6208th USAF Hospital, APO 74 San Francisco, Calif.

———. 1965. Comparison of Mosquito Surveys of Clark Air Base, R.P. Quarterly Report, 5th Epidemiological Flight (PACAF), APO San Francisco 96274.

HORSFALL, W. R. 1955. Mosquitoes, Their Bionomics and Relation to Disease. New York: The Ronald Press Co.

STONE, A., KNIGHT, K. L., and STARCKE, H. 1959. A Synoptic Catalog of the Mosquitoes of the World (Diptera, Culicidae) Washington: Entomological Society of America.