A STUDY OF *CULEX TRITAENIORHYNCHUS* OVIPOSITION ACTIVITY DURING 1955 [1]

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The seasonal incidence of *Culex tritaeniorhynchus* Giles, the only mosquito to have been found naturally infected with Japanese B encephalitis in Japan, has been studied extensively. This species, which has not been found in Japan during the winter, first appears during early spring in extremely small numbers (1–8). Its initial appearance is indicated by the collection of females which have been taken as early as April 6 (1). Its incidence rapidly increases and reaches a peak in the Tokyo area sometime between July 15 and August 7. Its numbers decrease sharply after this and it finally disappears in late fall. Larvae are normally found somewhat later than adults, although both have been collected as late as November 15. All of these studies have involved primarily observations of adults and larvae, with little attention to egg laying activity (1–8).

A study of oviposition activity was made during the summer and fall of 1955, with three objectives in mind: (1) to study the relationship between egg laying and temperature; (2) to observe the relationship between the decline in adult population and the decline in oviposition rate; (3) to determine whether the seasonal decline in oviposition activity is abrupt or gradual.

Two areas approximately 10 miles apart were selected for the study. One, located 25 miles north of Tokyo in the vicinity of Kawagoe, contained 57 concrete night soil tanks arranged in three double rows from which large numbers of *C. tritaeniorhynchus* egg rafts had been collected in previous years. The other area, approxi-

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mately 30 miles northwest of Tokyo in the vicinity of Johnson Air Force Base, contained 116 night soil tanks distributed in three locations northeast of the base. Each tank was approximately 5 feet long, 4 feet wide and 6 feet deep and was set in the ground with only 6 inches of its rim extending above the ground level. Both areas were within a 10 mile radius of Johnson Air Force Base and the general topography of that section was relatively flat. For this reason, meterological data from the weather squadron at Johnson Air Force Base were considered to be applicable to both areas and were used in the study (9).

METHOD. Egg raft collections were begun on July 11 in Kawagoe and were made daily except Sunday during July and August and daily during September and October. Collections from the Johnson Air Force Base area were begun on July 15

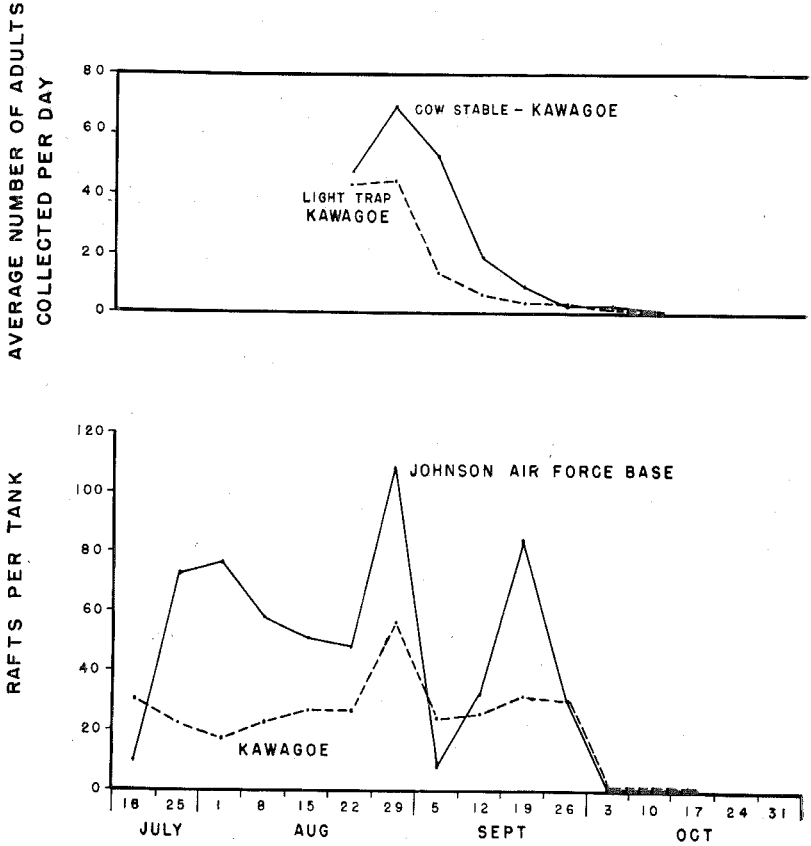

Fig. 1. Culex tritaeniorhynchus adult and egg collections from KAWAGOE and egg collections from JOHNSON AIR FORCE BASE for week ending on date indicated.

and were made 4 to 5 times each week. Egg rafts from each tank were collected in petri dishes containing moist filter paper, reared to fourth instar in the laboratory and identified.

Collection of adult *C. tritaeniorhynchus* was begun on August 16 in Kawagoe on the same schedule as were the eggs from that area. Adults were taken by a light trap located in the center of the tank area and from a cow stable approximately one hundred yards from the tanks.

Collections from both areas were discontinued on November 1.

RESULTS. Heavy oviposition was in progress and large numbers of adults were active at the time collections were begun. The average number of adults taken each day in Kawagoe and the daily average number of egg rafts collected per tank in Kawagoe and Johnson Air Force Base are presented for each week in Fig. 1. There were three peaks in egg raft collections from Johnson Air Force Base and two from collections in Kawagoe. Each from the latter area coincided with a collection peak at Johnson Air Force Base.

The major decline in egg raft collections from both areas took place during the two-week period of September 20 to October 3. Collections from Kawagoe declined from a daily average of 31 egg rafts per tank for the week ending September 26 to 1.28 for the subsequent week, while collections from Johnson Air Force Base declined from 30.5 egg rafts per tank to 0.87 during the same interval.

To study more closely this decline, the results of daily egg raft collections from both areas during this two-week period are presented in Fig. 2 with the daily maximum, mean and minimum temperatures and rainfall for the 12-hour period from 6 p.m. to 6 a.m. Since field observations during the course of this study indicate that this species oviposits during the hours from dusk to dawn, these results are considered to reflect the previous night's oviposition activity. For this reason weather data are presented for the 12-hour period 6 p.m. to 6 a.m. of the night previous to the day the eggs were collected, rather than for the entire day. Egg collection data from Kawagoe for September 18 are omitted since 75 percent of the larvae from egg rafts collected from the area on that date died before they could be identified.

Collections from Kawagoe declined from an average of 26 egg rafts per tank on September 26 to zero on September 28. Daily egg raft collections from September 28 through October 10, when the last egg raft was found, averaged only 0.5 raft per tank and did not exceed 1.8 raft per tank on any day during this period.

Daily collections from Johnson Air Force Base declined from an average of 30 egg rafts per tank on September 26 to zero on September 27. While a few were collected at the daily rate of 0.60 raft per tank during the period of September 27 through October 10, when the last egg raft was taken, the collection rate did not exceed 8.7 rafts per tank on any day after September 27. A marked decline in temperature occurred during the nights of September 25–26 and September 27–28. A minimum temperature of 54.1° F. and a mean temperature of 59.4° F. were recorded during the 12 hour period ending 6 a.m. September 26. These were 3° and 2.3° lower respectively than had previously been recorded during the study. A mean temperature of 56.2° F. and a maximum temperature of 58.1° F. were recorded during the 12 hour period ending 6 a.m. on September 28. These were 3.2° and 8.4° lower respectively than had been recorded earlier in the study.

On the night of September 26–27, 0.5 inch of rain fell during the period of 6 p.m. to 6 a.m. and 0.93 inch fell during the same time period on the following night. This probably influenced the oviposition activity.

To study more closely the relationship of oviposition to temperature fluctuations, a number of tanks were examined at hourly intervals between 6 p.m. and 5 a.m. on August 29–30 and September 7–8. No eggs were observed before 6 p.m. or

after 5 a.m. Eggs were collected, the resulting larvae reared to fourth instar and identified. Egg laying was sporadic with 28 rafts being laid before 12 p.m. and 21 after this time. Only 49 egg rafts were collected from the study tanks during the two nights of observation. The small number of egg rafts collected does not permit comparison of oviposition with temperature or humidity.

A total of 9,637 egg rafts were collected from Kawagoe, of which 65 percent were those of *C. tritaeniorhynchus,* 8 percent were those of other species, 15 percent

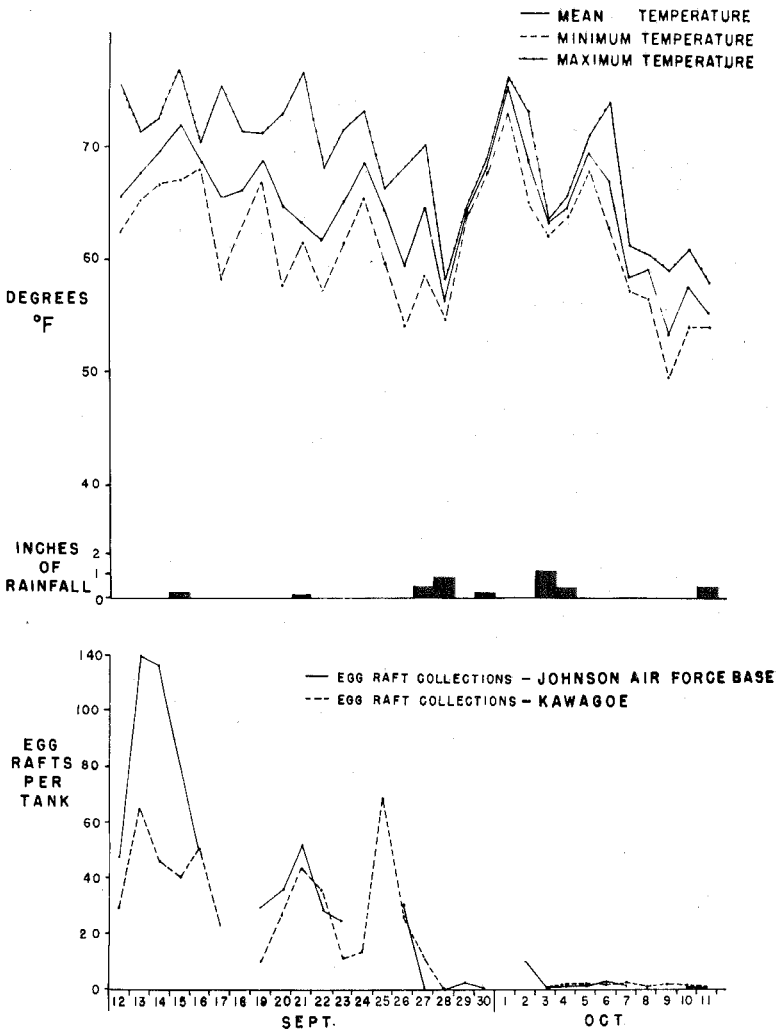

Fig. 2. Daily Culex tritaeniorhynchus egg collections, rainfall, minimum, mean and maximum temperatures. Figures for temperatures and rainfall are for 12 hr. period ending 6 AM on date indicated.

failed to hatch and 12 percent died before the resulting larvae could be identified. At Johnson Air Force Base, 7,599 egg rafts were collected, of which 74 percent were those of *C. tritaeniorhynchus,* 6 percent were those of other species, 10 percent failed to hatch and 10 percent died before they could be identified.

The number of adults collected at Kawagoe by light trap and from a cow stable declined rapidly after August 29. This preceded, by approximately three weeks, the general decline in egg raft collections from that area.

SUMMARY. Field studies of *Culex tritaeniorhynchus* oviposition activity were conducted in two study areas in the general vicinity of Tokyo during 1955. Egg raft collections declined abruptly in both areas, the decline occurring during September 26–28 in one area and September 26–27 in the other. Daily collections were negligible from September 28 through October 10 when the last egg raft was collected. Tanks were checked daily until November 1. A marked decline in temperature occurred during the nights of September 25–26 and September 27–28. A minimum temperature of 54.1° F. and a mean temperature of 59.4° F. were recorded during the 12 hour period ending 6 a.m. September 26. These were 3° and 2.3° lower respectively than had previously been recorded during the study. A mean temperature of 56.2° F. and a maximum temperature of 58.1° F. were recorded during the 12 hour period ending 6 a.m. on September 28. These were 3.2° and 8.4° lower respectively than had been recorded earlier in the study. Eggs were collected at hourly intervals on two nights. Oviposition occurred sporadically throughout one night and continued until 2 a.m. on the other night.

Adults were collected by a light trap and from a cow stable located in one study area during the period in which egg rafts were collected. The decline in adult collections preceded the decline in egg raft collections by three weeks.

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