OBSERVATIONS ON THE CONTINUOUS REARING OF *CULISETA INCIDENS* (THOMSON)

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INTRODUCTION. *Culiseta incidens* (Thomson) is a common mosquito in the San Francisco Bay region of California, where it breeds in artificial containers and shaded pools of various kinds throughout most of the year. The potential medical importance of this species as reflected in studies by Hammon and Reeves (1943 and 1943a) and Reeves and Hammon (1946) on the experimental transmission of western equine, St. Louis, and Japanese B encephalitis suggests the desirability of its colonization in the laboratory. This mosquito seems hardy, and the fact that the writer was able to rear it into the third generation under rather adverse conditions suggests that a permanent colony could be maintained under more favorable circumstances. The rearing experiment, which was continued for about 4 months, was done in the apartment of the writer where there were no facilities for controlling such factors as light, temperature, and humidity. The temperature ranged from approximately 55 to 75 degrees Fahrenheit, and the relative humidity was estimated to average 65 percent.

CULTURE OF IMMATURE STAGES. The colony was started with third and fourth instar larvae collected in March, 1950, from stream-side pools in Alameda County. Shallow trays of tap water were provided for the larvae and a pinch of finely ground Purina Chow pellets was added to each container at one- or two-day intervals. Dead larvae were removed daily. The water was changed whenever a scum began to develop on the surface.

These same measures were repeated with the F_1 generation, but they proved to be inadequate. Retarded larval growth and a high mortality rate indicated a deficient diet. Following the technique of Frost, Herms, and Hoskins (1936), who successfully reared larvae of this species, the diet was changed to Fleischmann's yeast. An improvement in the health and vigor of the culture was almost immediately apparent. The percentage of survival was several times greater, and larval development was accelerated. The larvae of the F_2 generation were less vigorous and they developed into weak adults. This suggests the need for further nutritional experimentation and better controlled conditions.

Pupae were removed daily from the larval trays and transferred to a container with gradually sloping sides. This vessel was set inside a mosquito cage for the retention of emerging adults.

CARE OF ADULTS. The adults emerged in a conventional sleeve-type cage of cloth netting and wood construction, 13 inches high, 14 inches long, and 9 inches wide. Boiled raisins and small wads of cotton soaked with a sugar solution were placed on the netting. Both sexes fed readily. Females of the first generation refused to feed on the writer's arm when it was introduced into the cage, but those of the second generation took human blood quite readily. No evidence of mating activity was observed in either generation when the mosquitoes were in the small cage.

Six days after the emergence of the first adult of the original generation some 150 were released in a dimly lit bathroom 7 feet square and 8½ feet high. Cotton balls soaked with sugar solution were tacked to the walls for nourishment of both sexes. A small black pan filled with tap water to a depth of 2 inches was placed in the shower to receive any eggs that might be laid.

Late in the afternoon of the third day

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after the adults were released in this room, three mosquitoes fed on the writer. From then on a varying number of females fed each day, with a maximum of 24 blood meals being taken in one evening. Several females were observed to feed on a white rat in a small wire cage. However, the movements of the rat were sufficient to discourage most mosquitoes which attempted to feed on it. The mosquitoes would take blood meals only in the late afternoon or at night. The degree of illumination did not seem to influence their readiness to feed, but most feeding was done under artificial light.

MATING HABITS. Eight days after the mosquitoes were released in the room the first mating swarm was observed. Mating occurred nearly every night after this.

A mating swarm could usually be induced to form by turning on the light in the room. On each occasion a few males flew down from the walls and ceiling and began flying in erratic circles close to the floor. Other males later joined the flight and increased the size of the swarm. The swarms observed contained from ten to approximately fifty individuals. The largest swarms covered an area about four feet in diameter and extended from the level of the floor to two feet above it.

Females, apparently attracted by the high-pitched humming, flew into the swarm and were immediately seized in copulation. The copulating pairs became united by the tips of their abdomens and flew horizontally toward one of the walls, the female pulling the male. The female lit on the wall, and the male at times also came to rest momentarily. More often the male made efforts to escape. Finally becoming disengaged, the male usually flew away, leaving the female on the wall.

Other males, apparently fatigued by their courtship flights, were seen to leave the swarm and to rest on the floor or wall. If a mating swarm were left undisturbed, it would gradually decrease in numbers after an hour or so, until only one or two males remained. Swarming could be brought to a halt within a few seconds by merely turning off the light, as indicated by the cessation of the humming sound.

OVIPOSITION. Two egg rafts were discovered in the pan set out for that purpose eight days after the first mating was observed. Thereafter, an average of two rafts per night was laid over a period of a week, after which the breeding pan was removed. A pail containing a little water, which had previously received only one egg raft, then became the site of oviposition. All rafts, except one laid early in the morning, were deposited at night. The eggs took three days to hatch.

The writer was fortunate enough to witness two ovipositions while the light was on. In the first incident, a female was observed to hover above the pan for a time before alighting on the rim. Then it turned around and backed slowly down onto the water. It drifted on the water surface a short distance away from the side and began laying its eggs. In the second case the female was already on the water and had just begun ovipositing. It completed its raft 14 minutes later. The pointed end of the boat-shaped raft is formed first, the last eggs forming the rounded end.

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