OPERATIONAL AND SCIENTIFIC NOTES

NOCTURNAL MATING IN *MANSONIA (MANSONIOIDES)* SPP.[1]

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The mating behavior of *Mansonia* (*Mansonioides*) exhibits a number of unusual features. Firstly, swarming by males has only been observed on rare occasions (Wharton, 1962), despite the ubiquity and abundance of this group of mosquitoes throughout the Old World tropics. Secondly, mating is known to occur in the vicinity of warm-blooded hosts, and males are frequently caught in small numbers on human bait at night (Mattingly, 1949; Hamon, 1963). Thirdly, mating has been observed on moonlit nights some hours after nightfall (Jayewickreme, 1953; Antonipulle et al., 1958).

As part of a program of studies in the Gambia on the flight pattern of West African mosquitoes, unbaited electrical suction traps were set up with their orifices horizontal. Any small insects flying over the mouths of the traps are sucked in and blown into cages attached below the fans. The traps were run from shortly after sunset to 1.5 hr before sunrise, and the cages were changed at 2300 hr local time, which was slightly more than 4 hr after sunset. In this way the catches were segregated into 2 lots, those trapped during the first 4 hr of the night and those active from 4 hr after sunset until 1.5 hr before sunrise. In sorting the catches occasional pairs of dead mosquitoes were found that had been caught while copulating. The pairs were joined with their abdomens end to end, and had evidently been killed by the blades of the fan as they were sucked into the traps. Their relative frequency in the 2 sets of catches thus provided some information on the time of mating.

The results (Table 1) show that, of 21 pairs of mosquitoes, 4 were caught in the first part of the night more than 45 min after sunset and 4 during the middle or later part of the night. Of those caught in the later period, 2 were on nights shortly after full moon, 1 on 2 nights after the first quarter, and 1 on 2 nights after the new moon. The capture of the last couple shows that moonlight is not essential for nocturnal mating to take place. These observations extend the findings of Jayewickreme of nocturnal mating of *M. uniformis* (Theo.) in Ceylon to both this species and *M. africana* (Theo.) in West Africa. They also show that mating in nature may take place in the absence of warm-blooded hosts.

Table 1. Numbers of *Mansonia* (*Mansonioides*) pairs caught *in copulo* in relation to time of night.

Onset of trapping period after sunset	*M.* (*M.*) *africana*	*M.* (*M.*) *uniformis*
12–25 min	0	13
45–60 min	1	3
>4h	2	2

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LONG RANGE ORIENTATION OF *MANSONIA (MANSONIOIDES)* MALES TO ANIMAL HOSTS[1]

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It is well known that males of *Mansonia* (*Mansonioides*) copulate in the vicinity of warm-blooded hosts (Jayewickreme, 1953) and that they commonly alight on human baits at night. This suggests that the host serves to bring the sexes together and that male mosquitoes actively orient towards him. In an earlier study (Gillies and Wilkes, 1972) we showed by the use of unbaited flight traps that the density of female *M. africana* (Theo.) and *M. uniformis* (Theo.) increased sharply as the bait was approached, and we used this to plot the long range orientation

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of mosquitoes towards the bait. In the present note we present data on the densities of males which suggest that, despite the relatively small numbers trapped, the flight pattern of this sex is also influenced by the presence of the bait.

Details of the technique are given in the original publication. Four radial lines of ramp-traps (Gillies, 1969) were set up in open farmland in the Gambia at intervals of 7.5 m, extending from 7.5 to 60 m from the center. Catches were done in 3 series in which the center of the area was either baited with 2 man-sized calves or with carbon dioxide released from a cylinder, or was left unbaited. The 2 sets of traps nearest to the bait (at 7.5 and 15 m) provided 45.3% of the total catch of males (53 mosquitoes) when calves were present, 16.1% when the center was baited with carbon dioxide (106 mosquitoes) and 27% when there was no bait (37 mosquitoes). A chi-square test for the difference between the calf-baited catches and others showed high significance ($p < 0.005$).

This shows that the presence of animals had a concentrating effect on males while still at some distance from the bait, suggesting that they were being guided towards it by either olfactory or visual stimuli. It might be suggested that males were orienting not to stimuli from the hosts but to female mosquitoes already concentrated at the bait or intercepted by the traps as they approached it. However, no such concentration of males was detected when the center was baited with carbon dioxide even though it was shown that this had a similar, if less marked, aggregating effect on females as animal baits. The results, therefore, lend support to the idea that, although males and females may mate in the absence of baits (Gillies, 1975) orienting responses to warm-blooded animals by both sexes may also operate to bring them together.

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THE EFFECTS OF ABATE 2G® MOSQUITO LARVICIDE ON SELECTED NON-TARGET ORGANISMS COLLECTED FROM FORESTED TEMPORARY POOLS

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Over the years the South Cook County Mosquito Abatement District has found that one of the most effective means of controlling *Aedes vexans* (Meigen) and *Culex pipiens* Linnaeus in forest preserve areas has been larviciding with 2% granular Abate 2G insecticide (O, O, O′, O′-tetramethyl O, O′ thiodi-p-phenylene phosphorothioate) applied at a rate of 2.5–5.0 lbs/acre to temporary and permanent standing water. Such larviciding practices have necessarily conflicted with the established goals of the Forest Preserve District. In the past 2 years questions have arisen regarding the effects of this larviciding practice on the non-target organisms occupying the same habitat as the mosquito larvae.

The non-target organisms which were found to be most abundant in the Thornton Division of the Cook County Forest Preserve District were cladocerans, copepods, ostracods, midge larvae, hydrophilids, and snails. To evaluate the effects of Abate 2G on these non-target organisms, the following experimental procedures were carried out.

Simulated natural conditions were prepared in six 10-gallon aquaria by the addition of 1.2 liters of debris and approximately 40 liters of pond water per aquarium. The following populations of test organisms were then introduced into each aquarium: Non-target—Order Cladocera, *Simocephalus* sp., and *Ceriodaphnia* sp. [number added per aquarium (NPA), approximately 530,000]; Order Copepoda, *Cyclops* sp., *Ectocyclops* sp., and *Eucyclops* sp., (NPA, 1,500); Order Ostracoda, 1 species (NPA 328,000); Order Coleoptera, Family Hydrophilidae, 1 species (NPA 5); Order Diptera, Family Chironomidae, 1 species (NPA 20); Family Chaoboridae, *Chaoborus* sp. (NPA 20); and 1 species of snail, Order Gastropoda, *Physa* sp. (NPA 10). The target organism used was *Culex pipiens* (NPA 200).

To facilitate the introduction of the populations, it was necessary to remove first all organisms originally collected with the debris and pond water. This was accomplished by multiple washings of the debris and by filtering the pond water through a plankton net. Once the populations were introduced into the 6 aquaria, aeration was provided at a similar rate for each. Organisms