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Positive Geotaxis in Gravid *Culex pipiens fatigans*

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The work reported here was done in the field in Rangoon, Burma, in 1965. The results showing positive geotactic behaviour on the part of gravid *Culex pipiens fatigans* were very striking but since lack of time did not permit a repetition of the experiments they were not published. Since then we have been reminded of the work of Kennedy,^b who demonstrated the same phenomenon in *C. p. molestus* and *C. p. pipiens*. Kennedy's elegant experiments demonstrated both in the laboratory and in a garden that the approach to water is at ground level, where oviposition takes place. This entirely agrees with our findings and serves to confirm them; accordingly, we now have no hesitation in reporting them here, especially as they have some promising practical applications in the field.

Experimental

Our attention was first drawn to the subject through our work on adult mosquito behaviour in and around a septic tank in which *C. fatigans* bred in very large numbers. In order to time the arrival of gravid females at this breeding site a trap, since called the "FRU gravid female trap", was installed over the open manhole of the tank. The trap consisted of a simple gauze cage measuring 21 in x 20 in at the base and 28 inches high in front (51 cm x 53 cm x 71 cm) with a sloping roof to keep out the rain. The trap had a louvred entrance a little less than 1 foot (30 cm) from the bottom which allowed attracted adults easy access to the trap. The bottom

(of the trap) was gauzed so that, though emanations from the septic tank could rise through the manhole, the gravid females could not pass into its interior. We soon showed that this trap was very effective and that large numbers of gravids could be caught. It was about equally effective when it was placed over a tray holding septic-tank water—incidentally, by this means we were able to demonstrate the existence of a previously unsuspected biphasic oviposition cycle for *C. fatigans*.^c

The success of this relatively small trap led us to construct a much larger one to take a tray holding about 10 UK gallons (about 45 litres) septic-tank water. The louvred opening was now situated about 3 feet (90 cm) above ground level. Instead of an increase in the numbers caught, however, there was actually a sharp drop. In 12 nights of continuous catching, for instance, the large trap caught a total of 605 gravids whereas the smaller one was taking up to 400 in a single night. This was puzzling until it was noticed that adults were flying low down near the base of the trap and rarely if ever approached the louvred entrance. The possibility that this behaviour could be due to a geotactic response suggested itself and we accordingly performed the following two experiments.

Experiment 1: three trays holding breeding water at widely different heights. One of these trays was placed on the ground, the second 5 ft (1.5 m) and the third 10 ft (3 m) above ground level. In three complete nights of collecting we found 1223, 12 and 0 rafts respectively in

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^b Kennedy, J. S. (1942) *Bull. ent. Res.*, 32, 279.

^c Meillon, B. de, Sebastian, A. & Khan, Z. H. *Bull. Wld Hlth Org.* (in press).

the three trays. Obviously there was an overwhelming preference for the tray at ground level.

Experiment 2: six trays separated by short vertical distances. In this experiment identical trays each measuring about $3 \times 2 \times 0.3$ ft ($90 \text{ cm} \times 60 \text{ cm} \times 9 \text{ cm}$) were used. The first tray was sunk so as to bring the water surface approximately level with the ground; the rest of the trays were then raised one above the other as shown in the accompanying figure.

The results are shown in the table.

ARRANGEMENT OF TRAYS FOR EXPERIMENT 2^a



^a Six trays with septic-tank water arranged one above the other to a height of 44 in (112 cm) above ground level. The first tray is sunk in the ground; 80% of the rafts were deposited on it.

NUMBER OF RAFTS OF *C. FATIGANS* DEPOSITED OVER 6 CONSECUTIVE NIGHTS AT DIFFERENT HEIGHTS ABOVE THE GROUND

Tray No.	Height above ground ^a		No. of rafts deposited
	in	cm	
1	0	0	1942
2	2	5	78
3	7	18	163
4	14	36	78
5	26	66	96
6	44	112	56
Total			2413

^a Approximate height of water surface above ground level.

The results amply confirm Kennedy's work and show that, as in the species Kennedy worked with, *C. fatigans* females prefer to oviposit at ground level.

A variety of ways of exploiting this peculiarity in the behaviour of gravid *C. fatigans* immediately suggest themselves, e.g., traps for assessment of the gravid population before, during and after control campaigns, or even for extermination of the species under certain circumstances. Obviously, the stronger the attractant used in the trap the more adults will be caught; the identification of the active principle and its production in a pure and concentrated state thus calls for immediate investigation.

The observations recorded here also indicate that traps for adults, that ordinarily rest well above ground level, may not give a true picture of population structure.