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THE DISTANCE OF ATTRACTION OF CDC LIGHT TRAPS TO PHLEBOTOMINE SANDFLIES

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SUMMARY. The range from which *Phlebotomus ariasi* Tonnoir, 1921 is attracted to a CDC light trap was studied in the field in France by suspending a CDC trap, without a cage, over one of a line of 7 large suction (LS) traps. The LS trap under the CDC trap caught many more sandflies than the other LS traps and the pattern of the catches showed that *P. ariasi* is attracted to the light of a CDC trap at distances <2 m. It is concluded that, in studies on the dispersal of marked sandflies, CDC traps would not artificially increase the distance of dispersal and that, in suitable weather, the aerial population of *P. ariasi* is large and constantly moving during the nocturnal period of activity.

Distances d'attraction des pièges lumineux CDC vis-à-vis des Phlébotomes.

RÉSUMÉ. La distance à laquelle *Phlebotomus ariasi* Tonnoir, 1921 peut être attiré par un piège lumineux CDC a été étudiée dans le foyer leishmanien des Cévennes, à Roquedur-le-Bas (Gard). Pour cela, un piège CDC a été suspendu sans cage, au-dessus d'un alignement de 7 grands pièges à succion (LS). Le piège LS disposé sous le piège CDC a capturé beaucoup plus de Phlébotomes que les autres pièges LS. L'échantillonnage des prises a montré que *P. ariasi* est attiré par le piège CDC à une distance inférieure à 2 m. Deux conclusions sont tirées : les pièges lumineux CDC n'accroissent pas artificiellement les distances de dispersion dans les études portant sur des Phlébotomes marqués; sous réserve de conditions météorologiques convenables et pendant la période d'activité nocturne, la population aérienne de *P. ariasi* est à la fois importante et constamment mobile.

In a mark-release- recapture study of the dispersal of *Phlebotomus ariasi* Tonnoir, 1921 in the Cévennes, southern France, we used CDC miniature light traps* as one method of recapturing marked flies and found that the flies commonly moved up to 1 km or, rarely, 2 km from the point of release (Killick-Kendrick *et al.*, 1984). This sandfly is a proven vector of *Leishmania infantum* Nicolle, 1908 (see review by

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Killick-Kendrick and Rioux, 1981) and it was concluded that movement of the fly was a factor in the spread of visceral leishmaniasis from one place to another in the Cévennes focus. There was, however, a possibility that the distances of dispersal had been artificially increased by the use of the CDC traps the lights of which may have attracted the sandflies from considerable distances. In the summer of 1983, therefore, we carried out field experiments to find out from what distance *P. ariasi* is attracted to CDC traps.

Materials and Methods

Three experiments were carried out in a valley in the commune of Roquedur, Gard, France, which is described by Rioux *et al.* (1979). One experiment was done on the night of 27-28 July, 1983 and two on the following night.

Large suction (LS) traps were made with 9 in (23 cm) Standard model Ventaxia* fans mounted horizontally on a wooden frame with a cross section of 37 × 37 cm and a height of 58 cm. A copper gauze cone 25 cm in diameter at the mouth and 30 cm in length was fitted to the exhaust side of the fan. A brass tube 8 cm long by 8.5 cm in diameter, forming the bottom of the cone, rested inside a nylon gauze cage suspended by tapes in a wood and wire frame (24 × 24 × 24 cm). Insects passing over the fans were sucked in and blown through the cone into the cage (Snow, 1975). A CDC light trap *without a collecting cage* was suspended over one of these traps so that the light bulb of the CDC trap was centrally placed 23 cm from the top of the fan of the LS trap. The light was a 6 V 60 mA spherical bulb giving 1 nominal lumen at 6 V (0.08 cd) ; the trap was powered by 4 rechargeable 1.5 V batteries which were fully charged at the beginning of each experiment.

Seven LS traps, powered by a generator, were set up on a hillside in a line, 2 m apart, according to a prevailing katabatic wind. Three LS traps were upwind and 3 downwind of the LS trap with the suspended CDC trap above it. The LS traps were run at the lowest of the three speeds available on the control boxes. The mean speed (± SD) of the 7 traps was 726 ± 33.1 r.p.m.

In experiment 1, the traps were run for 50 mins ; in experiments 2 and 3, they were run for 60 mins. The average wind speed of the previous 10 secs and ambient temperatures were recorded at 5 minute intervals. Wind direction was recorded with an ultrasensitive wind vane which responded to winds of < 0.1 m/sec. It was connected to a "Rustrak 280" single channel recorder modified to include an interface with the opto-recorder of the sensor**. Readings were recorded every 2 sec on a chart moving at 25.5 cm/h.

All sandflies caught (expt 1) or samples of one third of the catch (expts 2 and 3) were identified as *P. ariasi* by the examination of the external genitalia of males or the spermathecae of females. Of many thousands of identified sandflies caught in LS

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** Didcot Instrument Co. Ltd., Station Rd., Abingdon, Oxfordshire, OX14 3LD, England.

traps on the same study site in other work, over 99 % were *P. ariasi ;* the remainder were rare specimens of *P. perniciosus* Newstead, 1911 or *P. mascittii* Grassi, 1908. It is therefore assumed that the unidentified flies in the present work were *P. ariasi.*

Results

The numbers of female sandflies caught in each LS trap in three experiments are shown in *table I.* With the results of experiment 1 (which was run for only 50 min) corrected to express the catch as females per trap hour, the following comparisons can be made. The mean number (± SE) of females caught in the LS trap with a CDC trap suspended above it was 24.9 ± 8.0 per trap hour. That of the LS traps without a CDC was 8.5 ± 0.75. This last figure is not significantly different from the mean number (8.3 ± 0.49) of females of the aerial population caught per trap hour in the same LS traps without bait animals (or CDC trap) in six control experiments run in the same place in unpublished observations on the host finding behaviour of *P. ariasi.* The mean numbers (± SE) of female flies caught in LS traps downwind from the CDC trap (5, 6 and 7) compared to those upwind (1, 2 and 3) were not significantly different (9.00 ± 1.22 and 8.04 ± 0.94 per trap hour ; $p = > 0.05$).

In addition to the total of 220 female sandflies caught in the three experiments, 45 male flies were captured. The numbers of males per trap varied from 0-6 and the ratio of males to females was 1 : 5.

TABLE I. — Showing numbers of female *P. ariasi* caught in each of a series of large suction traps over one of which (No 4) a CDC light trap was suspended.

Nos of LS traps	Numbers (and %) of ♀♀ per trap			Totals (and %) of ♀♀ per trap
	Expt 1	Expt 2	Expt 3	
1	4 (9.8)	10 (8.9)	9 (13.4)	23 (10.5)
2	5 (12.2)	10 (8.9)	7 (10.5)	22 (10.0)
3	3 (7.3)	12 (10.7)	10 (14.9)	25 (11.4)
4 + CDC	14 (34.1)	41 (36.6)	17 (25.4)	72 (32.7)
5	4 (9.8)	17 (15.2)	8 (11.9)	29 (13.2)
6	6 (14.6)	12 (10.7)	8 (11.9)	26 (11.8)
7	5 (12.2)	10 (8.9)	8 (11.9)	23 (10.5)
Totals	41 (100.0)	112 (100.0)	67 (100.0)	220 (100.0)
Time of experiment :	23.43-00.33 h	22.43-22.43 h	00.10-01.10 h	
Mean °C ± SE :	21.8 ± 0.09	22.8 ± 0.21	21.1 ± 0.12	
Mean wind speed (m/sec) ± SE :	0.13 ± 0.04	0.25 ± 0.04	0.16 ± 0.06	
Proportion of period with wind down line :	100 %	66 %	56 %	

Discussion

The wind speeds throughout all three experiments were well below levels which adversely affect the activity of *P. ariasi*. The comparatively high total catch in experiment 2 was probably due partly to the temperature, which was higher than during the other two experiments, but mostly to the time of experiment 2 which was the only one of the three done wholly during the peak period of activity of *P. ariasi* (21.00-24.00 hrs ; Rioux *et al.*, 1969).

The high numbers of sandflies caught in LS trap 4 are explained by the attraction of flies to the suspended light trap. In our unpublished work on host finding behaviour done in the same place as this work, it was found that, like mosquitoes, *P. ariasi* females move against winds of suitable speeds in search of a host and it is known, therefore, that the general direction of travel of the flies caught in the experiments described here was from LS trap 7 upwind to LS trap 1. Had the flies been homing in against the wind towards the CDC trap from distances > 2 m, larger numbers would have been caught in the downwind than the upwind traps. The absence of a gradient of numbers of flies in the LS traps downwind from trap 4, and the lack of difference in numbers caught up and downwind of that trap are evidence that *P. ariasi* responds to the light of a CDC trap at distances < 2 m (the distance between the LS traps). By comparison, the range of attraction of a CDC trap to mosquitoes in West Africa was judged to be < 5 m (Odetoyinbo, 1969).

It is concluded that the use of CDC traps to recapture marked specimens of *P. ariasi* would not increase the distance of dispersal of the sandfly. The findings also show that a large aerial population of *P. ariasi* is in constant, active movement whenever the weather is suitable. On still warm nights, a CDC light trap in a good position will catch many non-teneral *P. ariasi* night after night. Since the distance of the attraction of the light appears to be less than 2 m, the flies are not being drawn from far away ; the catch is of mobile flies passing close to the trap.

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