

VERTICAL STRATIFICATION OF *Culicoides diabolicus*
(DIPTERA: CERATOPOGONIDAE) AT TURURE
FOREST, TRINIDAD

E. S. TIKASINGH¹ AND J. B. DAVIES²

INTRODUCTION. *Culicoides diabolicus* Hoffman is a widely distributed species of midge in central and northern South America. According to Wirth and Blanton (1959), the species is found in Mexico, Honduras, Guatemala, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Venezuela, Surinam, French Guiana, Brazil and Trinidad.

In Trinidad this species is found mainly in the forests. Aitken (1957) pointed out that it was frequently caught at both ground and canopy levels in the forest, but gave no quantitative data. In 1968 Aitken *et al.* list this species as occurring only in the canopy in Bush Bush Forest.

During the course of arbovirus investigations at Turure Forest, a seasonal swamp forest of secondary growth in northeastern Trinidad, a large number of *diabolicus* was collected showing its distinct predilection for the canopy levels of the forest. This paper gives quantitative data supporting the hypothesis that in Turure Forest this species is more active in the canopy than at ground levels.

MATERIALS AND METHODS. Two battery-operated light traps (Sudia and Chamberlain, 1962) and two suction traps (Davies, 1970) were operated 4 days per week from 1st October to 19th December 1968. Two stations were chosen about one-half mile apart, designated T 5 and T 9. On alternating nights both light traps were operated on ground (3 ft.) and canopy (25-30 ft.) levels, while the suction traps were operated at these levels on alternate days. The suction traps were baited with 7-day-old chicks. Both types of trap were fitted with a fine nylon mesh net to retain the *Culicoides*.

The sand flies were collected by aspiration in the field and sent to the Laboratory in Port-of-Spain in 1" x 2 3/4" plastic vials.

RESULTS. The traps were operated for a total of 89 trap nights at the ground level and 84 trap nights at the canopy level, during which time a total of 9,428 *diabolicus* were collected. Of this total 1,409 (15.83 trap/night) were caught on the ground as compared to 8,019 (95.46 trap/night) in the canopy giving a ratio of 1:6. The light traps caught double the number of sand flies as did the suction traps.

At ground level the light traps caught 20.38 *diabolicus* per trap/night as compared to 135.46 per trap/night in the canopy (Table 1). Thus,

approximately 7 times more *diabolicus* were caught in the canopy with this trap. Fewer *Culicoides* were caught in the suction traps, but again the canopy collections outnumbered the ground collections by a ratio of 5 to 1.

Although it was expected that the chick-baited suction traps would not catch male *diabolicus*, we were surprised that no males were recorded from the light trap catches. In case they had been overlooked a further series of light trap catches at another trapping site, one-half mile away were carefully checked. They revealed that although 3,782 female *diabolicus* were taken at both levels during 48 trap nights, only three males were taken. The very occasional occurrence of males in light trap catches is puzzling, since we would have expected many more, but at this stage no explanation can be offered.

DISCUSSION. By both methods of collection *C. diabolicus* was obtained more frequently in the canopy than on the ground, indicating that this species may be more active in the canopy than on the ground. It might be argued that the light trap in the canopy attracted more *Culicoides* because the light was possibly visible from a greater distance, while the hood of the trap near the ground may prevent the light from shining upwards so its area of attraction may be limited to below the level of light. The similar results obtained with the animal-baited suction traps, however, indicate that this was not an important difference.

The fact that *diabolicus* readily bites man suggests that it may be a mammal feeder, and in Turure Forest it may well be that arboreal animals such as opossums and squirrels, in addition to birds, provide their blood meals.

Very little is known of its breeding habitat, but Williams (1964) collected it from rotting cocoa pods, rotting stump of "fig" (*Musa* sp.) and on the edge of fish (*Tilapia*) ponds.

TABLE 1.—Comparisons of ground and canopy catches of female *Culicoides diabolicus* by two catching methods.

	No. of specimens of <i>C. diabolicus</i> Caught		
	Light Trap	Suction Trap	Total
Ground			
Trap nights	48	41	89
Total caught	978	431	1409
Rate*	20.38	10.51	15.83
Canopy			
Trap nights	41	43	84
Total caught	5554	2465	8019
Rate*	135.46	57.33	95.46

* Rate = Total caught/No. trap nights.

¹ University of the West Indies, Trinidad Regional Virus Laboratory, Port of Spain, Trinidad.

² Medical Research Council External Staff, Trinidad Regional Virus Laboratory, Port of Spain, Trinidad.

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References

AITKEN, T. H. G. 1957. Pestiferous Trinidadian sandflies. J. Trin. Field Nat. Club. pp. 23-25.

AITKEN, T. H. G., WORTH, C. B., and TIKASINGH, E. S. 1968. Arbovirus studies in Bush Bush Forest, Trinidad, W.I., September 1959-December 1964. III. Entomologic studies. Am. J. Trop. Med. & Hyg. 17:253-268.

DAVIES, J. B. 1970. Two traps for biting Diptera currently in use in Trinidad. Trans. R. Soc. Trop. Med. & Hyg. 64(1):25-36.

SUDIA, W. D., and CHAMBERLAIN, R. W. 1962. Battery-operated light trap, an improved model. Mosq. News 22:126-129.

WILLIAMS, R. W. 1964. Observations on habits of *Culicoides* larvae in Trinidad, W.I. (Diptera, Ceratopogonidae). Ann. Entomol. Soc. Amer. 57(4):462-466.

WIRTH, W. W., and BLANTON, F. S. 1959. Biting midges of the genus *Culicoides* from Panama (Diptera: Heleidae) Proc. U.S. Nat. Mus. 109 (3415):237-482.

A GYNANDROMORPH OF *Culiseta inornata* (WILLISTON)

MARY K. BENGE

South Salt Lake County Mosquito Abatement District, Midvale, Utah

There has been only one reported gynandromorph for the genus *Culiseta* (Brust 1966) and this was *C. annulata* (Shrank). This is a note of a gynandromorph of *C. inornata* taken 5 September 1968 in a New Jersey type light trap collection for the South Salt Lake County Mosquito Abatement District. Specimens of *C. inornata* comprise 20-25 percent of the total season's catch in this trap.

The antennae, tori, and eyes were typically male. The palpi were male, with five segments, but one palp was shriveled to about one-half the normal male length. The wings were the same size.

The external genitalia were female, as were the reproductive organs. The ovaries and spermathecae were normal.

The tarsal claws were as follows:

First pair of legs: One leg missing; one claw

much longer with two bristle-like spines; shorter claw with one bristle-like spine.

Second pair of legs: Claws of equal length; one pair had one claw with well-developed spine while the other pair of claws had no spines.

Third pair of legs: Tarsal claws of equal length but much shorter than on other legs.

Literature Cited

BRUST, R. A. 1966. Gynandromorphs and intersexes in mosquitoes (Diptera: Culicidae). Canad. Journ. of Zool. 44:911-921.

BARLOW BOOSTER SUBMERSIBLE PUMPS

DENNIS RAMKE, Manager

Tulare Mosquito Abatement District,
Tulare, Calif. 93274

Since 1954 a submersible, portable 10-inch hydraulic pump known as the "Barlow Booster,"¹ which can be operated from a power take off unit mounted on a Jeep or tractor, has been found by the Tulare MAD to be very useful where large volumes of water have had to be pumped. The "Barlow Booster" is expressly designed for portable, high volume, low lift pumping. Uses include drainage, irrigation and dewatering.

The pump is (Fig. 1, Fig. 2) constructed of fabricated steel material that will take the bumps and rough handling a portable pump must sustain and yet maintain the alignment and tolerance built into the pump. All models of the "Barlow Booster" are straight in design with a discharge length of 12 feet. Various types of extensions such as canvas or nylon socks can be used as an extension for specialized pumping jobs. The design of the pumping units makes it possible for one man to make a setting or even load the large pump for transport. The extremely flexible unit and pump, plus the absence of any long pump shafts—which could become misaligned or damaged, plus the lack of dead weight, make the "Barlow Booster" unique in the field of portable pumps.

The "Barlow Booster" is furnished in four standard sizes; the following are the specifications:

Pump Size	GPM of Oil for 1800 RPM	Max. P.S.I.	GPM of Water 1800 RPM	
			3 foot head	10 foot head
6"	6	1000	850	550
8"	15	1000	1850	1330
10"	26	1000	2550	2100
12"	42	1000	4000	3300

¹ Manufactured by Barlow and Thompson, Tulare, Calif.