

TRAP BIASES INFLUENCING MOSQUITO COLLECTING¹

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ABSTRACT. During the summer of 1972, eighteen species representing six genera of mosquitoes were collected in Black Hawk Park, Cedar Falls, Iowa, using a New Jersey light trap, a dry ice baited CDC miniature light trap, an unbaited Malaise trap and biting collections. Collections were made to investigate trap biases.

The New Jersey light trap and the CDC minia-

INTRODUCTION. Among the types of traps used in studies of mosquitoes are the New Jersey light trap, CDC miniature light trap, and the Malaise trap. Huffaker and Back (1943) recognized the limitations of measuring a heterogeneous population using only the New Jersey light trap. Gunstream and Chew (1967) studied heterogeneous mosquito populations using a CDC miniature light trap as a baited trap and the Malaise as an unbaited trap. Morris and DeFoliart (1969) compared results of CO₂ bait traps and CDC miniature light traps in relation to species composition. Breeland and Pickard (1965) realized the potential of the Malaise trap as an unbiased mosquito

ture light trap collected the widest spectrum of mosquito species which included the following genera: *Aedes*, *Anopheles*, *Culex*, *Culiseta*, *Coquillettidia*, and *Psorophora*. The Malaise trap was selective for species of *Aedes* and *Culex*. The biting collection contained *An. punctipennis* and *P. horrida* in addition to representatives of *Aedes*.

trap. Evans and Owen (1965) reported data supporting the usefulness of the Malaise trap in sampling populations.

The study reported here was undertaken to evaluate the effectiveness and reliability of the different mosquito trapping methods in Black Hawk County, Iowa.

MATERIALS AND METHODS. The Cedar River basin, Black Hawk Park in Black Hawk County, Iowa was chosen as a suitable location for obtaining representative samples of mosquito populations. The vertical suction light trap (Model 50: mfr., Hausherr's Machine Works) described by Mulhern (1934) was used as one source of collection. It was equipped with a 40-watt frosted white incandescent bulb and a photoelectric cell that turned the electricity on at dusk and off at dawn. A second type of trap used was a CDC miniature light trap described by Sudia and Chamberlain (1962). At night the

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trap was operated on a 6-volt battery and was baited with 2 kilograms of dry ice. The dry ice was wrapped in newspaper and hung alongside the trap. The traps were hung 1 meter above the ground. The CDC trap was activated between 7:00 and 8:30 p.m., and the following morning, between 7:30 and 9:00 a.m., mosquitoes were removed for identification and counting. A 3rd method of trapping mosquitoes employed a hand-held vacuum aspirator as the mosquitoes attempted to feed. Samples were taken during 10-minute intervals with one arm exposed. Evening collections were made between 7:30 and 9:00. Dark blue clothing was worn during each collecting period. The Malaise trap (Townes 1962) was used as an unbaited trap. The Malaise trap was located in an open area and activated between 7:00 and 8:30 in the evening with mosquitoes collected the following morning between 7:30 and 9:00.

RESULTS. Table 1 is a checklist of the species collected by each trapping method. The New Jersey light trap and CDC trap collected similar species except for some species in *Psorophora* and *Culiseta*. *P. ciliata* and *P. horrida* were both collected

by the CDC trap but did not occur in the New Jersey light trap. *Culiseta inornata* occurred in the light trap and not in the CDC trap. Although the Malaise trap was unbaited, it seemed to be selective for *Aedes* and *Culex*. The landing collection seemed to be specific for *Aedes*, *An. punctipennis* and *P. horrida* while collecting no *Coquillettidia*, *Culex*, or *Culiseta*.

Table 2 is a summation of the trap records for June, July, August and September. It shows the total number of mosquitoes collected during the period. Fig. 1 shows the species composition of all mosquitoes collected by all methods throughout the summer. *A. vexans* constituted 73 percent and *A. trivittatus* 20 percent of all the mosquitoes collected. A notable difference can be seen in the species composition (Table 2) when a comparison is made of the landing collection with the Malaise trap, light trap or CDC trap. *A. trivittatus* comprised 66 percent of the mosquitoes collected by landing while *A. vexans* comprised only 16 percent of the catch. *Anopheles* and *Culex* are also absent from the biting collection. It should be noted that although the number and types of mosquitoes collected is

Table 1. Species checklist for Black Hawk Park, Black Hawk County, Iowa, 1972.

Species	Light Trap	Malaise Trap	Landing	CDC Trap
<i>Aedes c. canadensis</i> (Theobald)	X		X	
<i>nigromaculis</i> (Ludlow)	X			X
<i>sticticus</i> (Meigen)	X	X	X	X
<i>triseriatus</i> (Say)	X		X	X
<i>trivittatus</i> (Coquillett)	X	X	X	X
<i>vexans</i> (Meigen)	X	X	X	X
<i>Anopheles punctipennis</i> (Say)	X		X	X
<i>quadrimaculatus</i> (Say)	X			X
<i>Coquillettidia perturbans</i> (Walker)	X			X
<i>Culex erraticus</i> (Dyar & Knab)				X
<i>p. pipiens</i> (Linnaeus)	X	X		X
<i>restuans</i> (Theobald)	X	X		X
<i>tarsalis</i> (Coquillett)	X	X		X
<i>territans</i> (Walker)	X	X		X
<i>salinarius</i> (Coquillett)	X			
<i>Culiseta inornata</i> (Williston)	X			
<i>Psorophora ciliata</i> (Fabricius)				X
<i>horrida</i> (Dyar & Knab)			X	X

small in comparison to the New Jersey light trap and CDC trap, collecting periods were for only 10 min. A comparison of the trapping methods is best seen by comparing the number of *A. vexans* taken by each of the collecting methods; 37 percent were collected by light trap, 61 percent by CDC trap, 1 percent by the Malaise trap and 0.7 percent by landing.

DISCUSSION. To measure the success of the New Jersey light trap, CDC miniature light trap baited with dry ice, Malaise trap, and landing collections these methods were compared quantitatively and qualitatively by the number and species of mosquitoes collected. Table 1 demonstrates definite biases in qualitative comparison.

Similar qualitative and quantitative catches were evident in light trap and CDC trap collections. Malaise trap and landing collections differed in the species of mosquitoes, and fewer mosquitoes were collected than with either the light trap or CDC trap. Since these 4 collecting techniques are commonly used by researchers, evidence from this study indicates that the New Jersey light trap or CDC miniature light trap baited with dry ice provide the best representative samples of mosquito populations.

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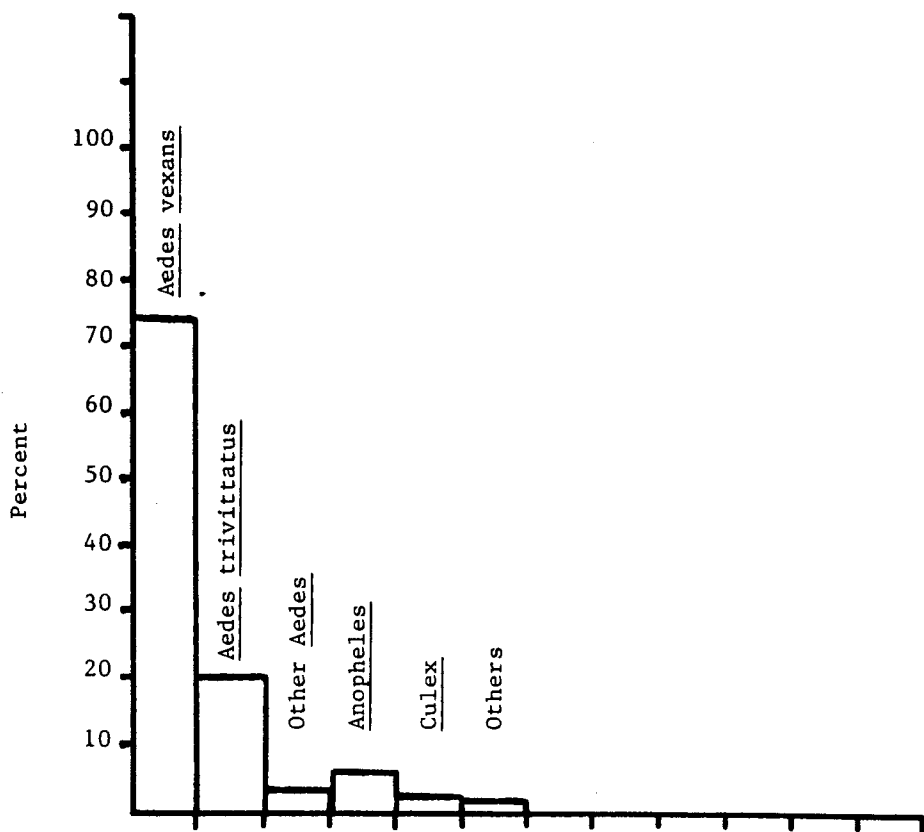


Fig. 1. Composition of Traps for June, July, August, and September, 1972.

Table 2. Cumulative trap records for Black Hawk Park, Black Hawk County, Iowa, June, July, August, and September 1972.

Species	Light Trap		Malaise Trap		CDC		
	Male	Female	Male	Female	Landing	Trap	Total
<i>Aedes c. canadensis</i> (Theobald)		3			1		4
<i>nigromaculis</i> (Ludlow)		2				1	3
<i>sticticus</i> (Meigen)		102		4	98	200	404
<i>triseriatus</i> (Say)		1		1	4	15	21
<i>trivittatus</i> (Coquillett)	13	603	1	16	427	2,719	3,779
<i>vexans</i> (Meigen)	489	4,610	23	192	104	8,310	13,728
<i>Anopheles punctipennis</i> (Say)	18	98		1		438	555
<i>quadrimaculatus</i> (Say)		2		1		1	4
<i>Coquillettidia perturbans</i> (Walker)	1	1				2	4
<i>Culex erraticus</i> (Dyar & Knab)		1				8	9
<i>p. pipiens</i> (Linnaeus)	3	9		1		18	31
<i>restuans</i> (Theobald)	23	88	2			40	153
<i>tarsalis</i> (Coquillett)	9	10	1	1		26	47
<i>territans</i> (Walker)		10		5		2	17
<i>salinarius</i> (Coquillett)		1					1
<i>Culiseta inornata</i> (Williston)	2	14					16
<i>Psorophora ciliata</i> (Fabricius)					3	2	5
<i>horrida</i> (Dyar & Knab)					9	19	28
Total males	558		27				585
Total females		5,455		222	646	11,801	18,124
Total adults	6,013		249		646	11,801	18,709

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