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THE EHRENBERG PIGEON TRAP AS A SAMPLER OF *CULEX* MOSQUITOES FOR ST. LOUIS ENCEPHALITIS SURVEILLANCE[1]

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ABSTRACT. The Ehrenberg pigeon trap, a portable unit which utilizes a pigeon as bait for collecting mosquitoes, was utilized as a vector surveillance tool during the 1975 outbreak of St. Louis encephalitis in New Jersey. The trap was highly selective for *Culex* species and the majority were *Culex pipiens*. Ovarian dissections using the Detinova technique revealed that the trap collected parous and nulliparous *C. pipiens* in nearly equal numbers. The utility of the trap as well as its selectivity for *C. pipiens* of broad physiological age make this trap an efficient tool for St. Louis encephalitis vector and virus surveillance.

INTRODUCTION. Baited traps gained recognition when Bellamy and Reeves (1952) used a modified lard can baited with dry ice to trap mosquitoes. A number of authors have since utilized the lard can trap with a variety of animal baits (Dow et al., 1964; Easton et al., 1968; and Taylor et al., 1966). Many trap types have also been designed for specific purposes using a variety of animals as bait (Ehrenberg 1966; Pillai and MacNamara 1968; and Service 1969).

The Ehrenberg pigeon trap (Ehrenberg 1966) which uses a pigeon as bait (Fig. 1), was designed primarily to monitor *Culex* populations and has been used regularly by the Bergen County Mosquito Extermination Commission in New Jersey as part of its surveillance program. During the 1975 outbreak of St. Louis encephalitis (SLE) in New Jersey a sampling technique was needed to monitor *Culex* populations and collect large numbers for virus assay. The suspect vector of SLE, *Culex pipiens* Linn., is not readily collected for

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Fig. 1. The pigeon is placed in the center chamber as bait in the Ehrenberg pigeon trap.

arbovirus assay by routine techniques, thus a special sampler was needed. Since *Cx. pipiens* is a nocturnal avian feeder (Crans 1968) and since Dow et al. (1964) obtained SLE isolates from a bird-baited lard can trap, the Ehrenberg pigeon trap was chosen. The effectiveness of the trap as an SLE surveillance tool is the subject of this paper.

MATERIALS AND METHODS. A complete description of the trap has been published by Ehrenberg (1966). From 7–12 traps were set out before dusk at suitable *Culex* collecting sites (Fig. 2) on 11 separate occasions from August 13 to September 18, 1975. Most of the sampling was done in the Hackensack Meadows area in Bergen County, N. J. because of the high *Culex* populations in close proximity to the metropolitan area. Preliminary studies indicated that the peak feeding activity for *Cx. pipiens* occurred just after sunset, thus the traps were operated no more than 3 hours into the night.

When the traps were taken down, the entry holes in the screen cone were plugged with cotton to prevent escape of mosquitoes. The screened sleeves containing the collections were removed from the cylinder (Fig. 3), placed in a plastic garbage bag, and sprayed with chloroform. When the mosquitoes were anesthetized, the sleeve was disassembled and the collection was placed on a white background for pooling (Fig. 4). The collection was divided into pools and aspirated into sterile vials. The pools of mosquitoes were then placed on dry ice for quick kill and transported to permanent storage for virus assay.

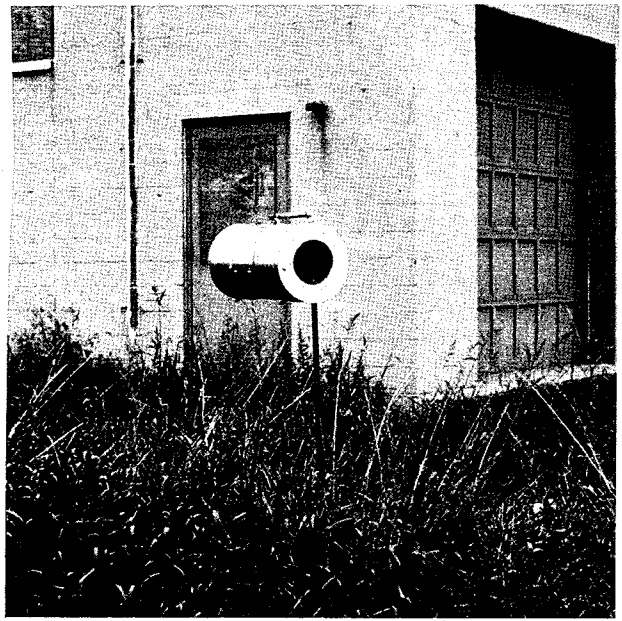

Fig. 2. The Ehrenberg pigeon trap is suspended from a pole at a *Culex pipiens* collecting site.

Ovarian dissections (Detinova 1962) were performed to determine the physiological age of *Cx. pipiens* females collected by the Ehrenberg pigeon trap. Specimens were dissected at hourly intervals during the entire night on 2 occasions.

RESULTS AND DISCUSSION. Although species in 4 genera of mosquitoes were collected by the Ehrenberg pigeon trap, *Culex* mosquitoes were predominant. (Table 1). Over 99% of the nearly 5,000 mosquitoes collected during the sampling period were *Culex*. The average *Culex* collection was 55.9 mosquitoes per trap during the period August 11 to September 18. Since collections were

Table 1. Mosquitoes collected by the Ehrenberg pigeon trap.

Genus	Number of individuals	% of total
Aedes	16	.30
Coquillettidia	3	.06
Culex	4967	99.60
Culiseta	1	.02
Average *Culex* collection	55.9/trap	

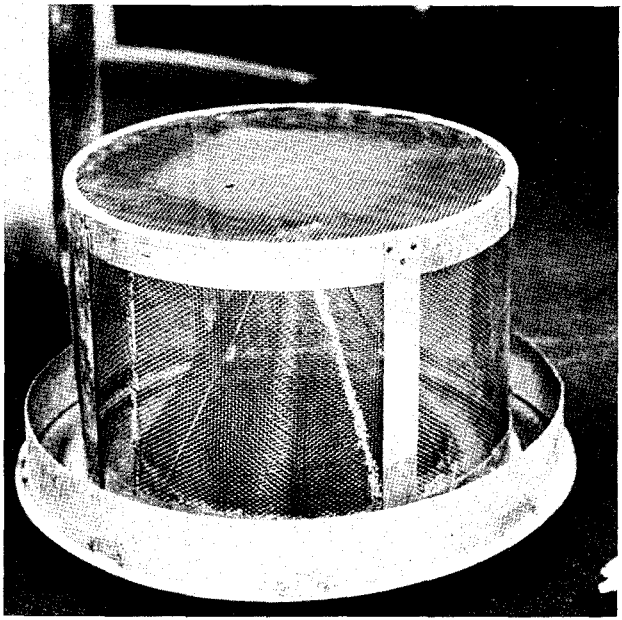

Fig. 3. The screened sleeves on each end of the Ehrenberg pigeon trap are removed to empty the mosquito collection.

decreasing in size as autumn approached, larger average collections would be expected if trapping by this method had been initiated earlier in the summer.

The composition by species of the *Culex* specimens collected over the sampling period in one area is shown in Table 2. *Cx. pipiens* comprised the major proportion of all collections and ranged from 59.3% to 88.2% of each collection. The overall average was 73.0% of the total *Culex* collection. These data indicate the attractiveness of the pigeon baited trap to *Cx. pipiens*.

The age structure of the *Cx. pipiens* population is shown in Table 3. The proportion of individuals having completed one gonotrophic cycle from each collection interval was expressed as % parous. During the nocturnal period that dissections were performed, 51% of the female *Cx. pipiens* entering the trap were found to be parous. Data in Table 3 also show that the parity rate remained relatively constant from dusk to dawn.

CONCLUSIONS. The Ehrenberg pi-

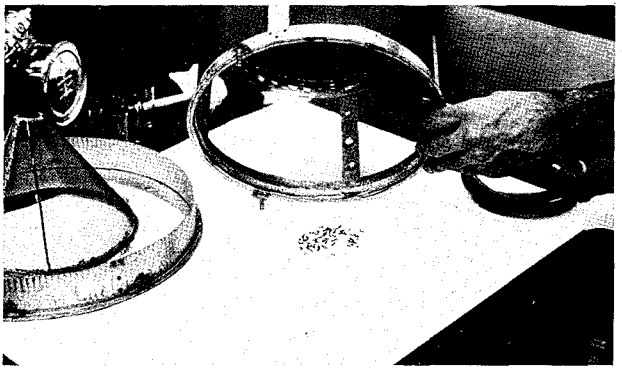

Fig. 4. The anesthetized collection of mosquitoes is emptied onto a white background for separation into pools for virus assay.

geon trap is entirely portable and relatively simple to use. The trap need not be operated all night but can be emptied within 3 hours of sunset for adequate *Culex* collections. The trap appears to be selective for *Culex* species, and in these studies nearly 75% were *Cx. pipiens*, the suspect vector of SLE to humans. The mosquitoes remain alive and are in excellent condition when the trap is emptied, thus most *Culex* are readily identified to species.

Ovarian dissections for parity indicated that the Ehrenberg pigeon trap collected a cross-section of the *Cx. pipiens* population by physiological age. A high percentage of parous individuals was taken by the trap, an important consideration when collecting mosquito specimens for virus assay since only parous individuals would be capable of harboring virus. In these studies, the parity rate remained constant during the night, thus samples taken from any portion of the activity period had equal probability of containing parous speci-

Table 2. Proportion of *Culex pipiens* collected by the Ehrenberg pigeon trap in the Hackensack Meadows, New Jersey.

Collection date	*C. pipiens*	*C. salinarius*	*C. restuans*	% *C. pipiens* of total
8/13	376	113	51	69.2
8/15	1171	94	170	81.6
8/25	653	44	43	88.2
8/29	118	45	36	59.3
9/05	550	123	148	67.0
9/11	93	15	27	68.9
9/12	279	38	102	66.6
9/18	232	41	7	82.9
Total	3472	513	584	$\bar{x}$=73.0

Table 3. Parity of *Culex pipiens* collected by the Ehrenberg pigeon trap at intervals over the entire nocturnal period.

Collecting period p.m.–a.m.	Number dissected	% parous
7:15– 8:15	11	55
8:15–10:15	20	50
10:15–12:15	16	50
12:15– 2:15	13	54
2:15– 4:15	16	50
4:15– 6:15	8	50
Total	84	Avg. 51

mens. In the opinion of the authors, the Ehrenberg pigeon trap is an effective sampler for *C. pipiens* and should become the collection tool of choice for SLE vector and virus surveillance.

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AN OVIPOSITION ATTRACTANT OF PUPAL ORIGIN IN *CULEX SALINARIUS*[1]

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ABSTRACT. Gravid females of *Culex salinarius* prefer water in which pupae have developed in selecting oviposition sites under laboratory conditions. Selectivity is primarily due to a nonfiltratable oviposition attractant of pupal origin.

INTRODUCTION. Studies on the oviposition of mosquitoes have shown that in at least 2 species a chemical factor associated with the immature stages influences the selection of a suitable oviposition site by gravid females.

Hudson and McLintock (1967) demonstrated a nonvolatile oviposition attractant for *Culex tarsalis* which appeared to be specific as ovipositing females selected emergence water which had contained their species in preference to emergence water from

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