

RELATIVE ABUNDANCE AND PARITY OF MOSQUITOES COLLECTED IN DRY-ICE BAITED AND UNBAITED CDC MINIATURE LIGHT TRAPS

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ABSTRACT. During the summer of 1973, 6,803 females were captured in a marsh and forest habitat by dry-ice baited and unbaited CDC Miniature Light Traps at a site 12 km. southwest of Ithaca, N.Y. Significantly more females were obtained from the marsh by dry-ice baited light traps and baited traps without light. Females of *Coquillettidia perturbans* and *Anopheles walkeri* comprised 88% of the total females captured in the marsh whereas *Anopheles quadrimaculatus* and *Culex restuans* females represented 10%. *Culiseta morsitans dyari* made up the remainder.

The use of dry ice with light traps has become a popular technique in mosquito surveys since the CO₂ source has been shown to increase the number of females captured. Newhouse et al. (1966) found that the addition of this material to CDC Miniature Light Traps greatly increased the number of females and species caught. A 30-fold increase in total mean catch for CDC traps baited solely with CO₂ and more than a 100-fold increase for traps baited with CO₂ plus light were reported by Miller et al. (1969). In Viet Nam, Herbert et al. (1972) indicated that the number of females obtained in unbaited light traps was lower than the number collected in CO₂-supplemented light traps.

In the absence of transovarial and mechanical transmission of pathogens and

Ovaries of 5,355 specimens were dissected, and parity was determined by the Detinova ovarian tracheation method. When the data were statistically analyzed for each species individually, the tests indicated that there were no significant differences in the percentages of parous specimens for results obtained within or between habitats. Comparisons made between species revealed significant differences in percent parous figures from both habitats, but the dry-ice baited traps (with and without light) proved most consistent in the collection of parous mosquitoes.

autogenous egg development, parous individuals have greater vector potential than nulliparous individuals. Since infectious organisms may be transmitted during the female's second and subsequent blood feedings and since evidence of oviposition in anautogenous mosquitoes implies that at least one blood meal has been taken, a knowledge of selectivity in sampling methods for the capture of parous mosquitoes could be used to increase the efficiency of arbovirus surveillance. This investigation was conducted (1) to determine whether or not the use of dry ice with CDC traps resulted in increased numbers of females caught, (2) to determine possible selectivity among sampling methods for the capture of parous individuals, and (3) to determine if collection results were consistent in marsh and forest habitats.

MATERIALS AND METHODS. Female mosquitoes were collected using 6 CDC Miniature Light Traps (Sudia and Cham-

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dyari (Theobald), more females of each species were captured in the marsh. Marsh collections of *Coquillettidia* (= *Mansonia*) *perturbans* (Walker) and *Anopheles walkeri* Theobald comprised 88% of the marsh capture and contained significantly more females than forest collections. Females of *An. quadrimaculatus* Say and *Culex restuans* Theobald represented 10% of the captures while *Cs. morsitans dyari* followed with 2% of the marsh catch. The numerical differences between marsh and forest collections of *An. quadrimaculatus*, *C. restuans* and *Cs. morsitans dyari* were not statistically significant.

The larger number of mosquitoes taken from the marsh were probably due to trap location; since the marsh traps were closest to larval habitats, they were probably the first that newly emerged females would encounter. Ovipositing females were also present in the marsh; after oviposition, these females would also be more likely to encounter the marsh traps before the forest traps.

Morris and DeFoliart (1969) indicated that *Coq. perturbans* females were taken in considerably greater numbers in the light traps than CO₂ traps. Bradley and King (1941) and Huffaker and Back (1943) reported that *An. walkeri* females were readily attracted to light. At Danby, N.Y., the dry-ice baited light traps and the baited traps without light caught more females than unbaited light traps. Although fewer *Coq. perturbans* and *An.*

walkeri females were captured in forest traps, the light traps plus the CO₂ source proved most efficient for survey in both habitats.

From 5,355 dissected females, parity data (Table 2) revealed that for each species there were no significant differences between habitats or among treatments within a habitat. However, comparisons among species indicated that, in forest collections, the percent parous figures for *Cs. morsitans dyari* in dry-ice baited light traps (64%) and unbaited light traps (63%) were both significantly greater than percent parous values obtained for *Coq. perturbans* in the baited light traps (19%) and for *C. restuans* in baited traps with light (21%) and without light (22%). The percentages tended to range from 38–67% in the marsh and from 38–58% in the forest for the multivoltine *Anopheles* species. In these *Anopheles* species, nullipars were continually entering the adult population, and therefore, the percentages of parous specimens rarely exceeded 50%. The relatively lower percentages observed for *Coq. perturbans* are probably attributed to trap location; the large number of emerging nullipars strongly influenced the results. The highest percentages of parous specimens were observed in samples taken from unbaited light traps, but these results were based on small sample sizes. The number of parous specimens obtained from either of the dry-ice baited sampling methods was significantly greater than the

Table 2. Total dissections and percentages of parous specimens for samples taken from two habitats by dry-ice baited and unbaited CDC Miniature Light Traps, Danby, N.Y., 1973.

Species	Total dissected	Marsh			Total dissected	Forest		
		Light and dry ice	Dry ice (no light)	Light		Light and dry ice	Dry ice (no light)	Light
<i>An. quadrimaculatus</i>	279	42	41	38	216	42	38	50
<i>An. walkeri</i>	2,073	46	40	67	370	40	50	58
<i>Coq. perturbans</i>	1,319	20	21	33	560	19	34	41
<i>C. restuans</i>	246	35	46	40	131	21	22	46
<i>Cs. morsitans dyari</i>	81	31	43	56	80	64	36	63
Totals	3,998				1,357			

number taken by the unbaited light trap method.

Morris and DeFoliart (1969) discussed the epidemiological significance of capturing parous individuals and emphasized that a trap which collects more parous specimens is a better surveillance tool than one which simply collects the most species. Watts et al. (1974) reported that transovarial transmission of the La Crosse strain of California encephalitis virus occurred in *Ae. triseriatus* (Say) under both field and laboratory conditions. Also, transovarial transmission of the Keystone strain of California encephalitis virus takes place in *Ae. atlanticus* Dyar and Knab (Le Duc et al. 1975). If this type of transmission is prevalent in several mosquito species, then it is important to attempt virus isolations from field-collected nulliparous as well as parous specimens. The results of the present study confirm the work of Morris and DeFoliart (1969, 1971) in that sampling methods yielded a mixture of nulliparous and parous specimens. Once the age of a female is determined, the remaining body parts of the dissected specimens can then be pooled according to age and species, and virus isolation tests can be made. The age separation of field-caught females before virus isolation may ultimately indicate the occurrence of infected nullipars as well as parous individuals in natural conditions. The combined parity and virus isolation studies thus may provide information on the overwintering of viruses and the prevalence of transovarial transmission.

The favorable response of *Coq. perturbans* and *An. walkeri* females to dry-ice baited light traps facilitates the collection of large numbers of mosquitoes for arbovirus survey. Results of the present study indicate that CDC traps baited with dry ice (with or without a light source) used in a marsh habitat would be more practical than collecting females of these species in the forest. With larger

numbers of specimens, the chances of isolating a virus would be greater.

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