THE SIZE OF EMERGING AND HOST-SEEKING *AEDES AEGYPTI* AND THE RELATION OF SIZE TO BLOOD-FEEDING SUCCESS IN THE FIELD[1]

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ABSTRACT. The average wing length of *Aedes aegypti* females collected as pupae was 2.47 mm, which was significantly smaller than the 2.64 mm average wing length of the host-seeking females collected in the field. The average wing length of nulliparous host-seeking females was 2.62 mm, which was significantly smaller than the 2.76 mm wing length of parous host-seeking females. Thus, small *Ae. aegypti* females exhibited reduced blood-feeding success and, most likely, reduced survival when compared with large adults.

INTRODUCTION

Large body size has been experimentally related to increased survival in adult *Aedes triseriatus* (Say) (McCombs 1980[2]) and *Culex tarsalis* Coquillett (Reisen et al. 1984), and to increased parity in a field population of *Ae. triseriatus* (Haramis 1983). Natural populations of *Aedes aegypti* (Linn.) show considerable variation in body size (K. O. Klotter, Florida Medical Entomology Laboratory; R. J. Novak, CDC San Juan Laboratories, personal communication). However, it is not known if adult body size in *Ae. aegypti* is an indicator of characteristics that affect vectorial capacity in natural conditions, such as survival and blood-feeding success.

The objectives of the present study were: 1. Investigate the extent of variation in adult body size in a field population of *Ae. aegypti,* 2. Examine the relationship between adult size and survival from emergence to blood feeding and, 3. Examine the relationship between body size and blood-feeding success in the field.

MATERIALS AND METHODS

The body size of *Ae. aegypti* emerging from field-collected pupae and host-seeking at human bait was studied in a tire dump (ca. 2,000 tires) located in DeQuincy (Beauregard Parish), Louisiana. Collections were made 1–2 times a week for 14 weeks (June 27 through September 27). *Aedes aegypti* pupae were sampled from 15 randomly chosen tires per occasion. No other container or tree hole habitats were found in the vicinity. In the laboratory the pupae were held at 27 ± 1 °C until 24 hr after adult emergence, and the wing length of each adult was measured (distance from the axillary incision to the apical margin excluding the fringe of scales, (Harbach and Knight 1980) using a binocular dissecting microscope equipped with an ocular micrometer.

Host-seeking females were collected at human bait with a battery-powered aspirator. In the laboratory, species identification was verified and wing lengths were measured. In addition, the ovaries of each specimen were removed, and the tracheoles were observed by phase contrast microscopy to determine parity (Detinova 1962).

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[2] McCombs, S. D. 1980. Effects of differential nutrition of larvae on adult fitness of *Aedes triseriatus.* Unpublished Master's Thesis, University of Notre Dame, Notre Dame, IN.

RESULTS

The mean wing lengths of females and males emerging from field-collected pupae and of host-seeking females are shown in Table 1. The average wing length of the host-seeking females was significantly larger than that of females collected as pupae. No significant differences in wing length could be detected within the host-seeking females or within the females or males collected as pupae when the early season population (first 7 weeks) and the late season population (last 7 weeks) were compared.

The overall percent parous of the host-seeking females was 16.3%. Even though the ranges overlapped, the average wing length of the parous host-seeking females (mean = 2.76 ± 0.22 mm, range = 2.24 − 3.12 mm, n = 25) was significantly larger ($p \leqslant 0.01$, Kruskal-Wallis ANOVA) than that of the nulliparous host-seeking females (mean = 2.62 ± 0.27 mm, range = 1.92 − 3.20 mm, n = 128) In addition,

Table 1. Wing lengths of the emerging and host-seeking *Aedes aegypti* collected in the field.

			Wing length (mm)	
Sex	Sample	N	Average	Range
Male	Emerging	101	2.05±0.16	1.67 − 2.47
Female	Emerging	81	2.47±0.20	1.92 − 2.91
Female	Host-seeking	153	2.64±0.27*	1.92 − 3.20

* Host-seeking female average wing length significantly longer than emerging female average wing length, ($p \leqslant 0.001$, Kruskal-Wallis ANOVA).

the percent parous in the larger 49.7% of the host-seeking females (n = 76) was 25%, which was significantly greater ($P \leq 0.0001$, test for equality of percentages) than the 7.8% parous in the smaller 50.3% of the host-seeking females (n = 77).

DISCUSSION

The wing lengths observed among the emerging *Ae. aegypti* males and females showed a great range of variation. The longest wing lengths sampled were ca. 50% longer than the shortest wing lengths. Since wing length is known to be directly related to body size in *Ae. aegypti* (Christophers 1960), it is apparent that body size varied significantly in the population of *Ae. aegypti* found in this tire dump. Although size variation in *Ae. aegypti* can be genetically influenced, (Greenough et al. 1971), all specimens in this study were collected from a single site indicating that the size variation was environmentally induced.

Body size, as reflected by wing length, appears to be related to survival and blood-feeding success in the field. The observation that female *Ae. aegypti* collected as pupae had significantly smaller wing lengths than host-seeking females suggests that mortality prior to blood-feeding was higher in the smaller adults than in the larger individuals. These results could be misleading if the large host-seeking females were produced in more suitable habitat types that were not sampled. However, this is unlikely since discarded tires were the only habitats containing *Ae. aegypti* that could be found in the vicinity.

The results also show that the parous host-seeking females were significantly larger than the nulliparous host-seeking females, and that the percent parous in the larger 50% of the host-seeking females was significantly higher than the percent parous in the smaller 50% of the host-seeking females. These results provide additional evidence that the larger females were more successful in locating hosts or that a greater proportion of the larger females live long enough to seek a second blood meal. Whether due to increased survivorship or to a greater host-seeking flight ability as a result of greater energy stores at emergence (Nayar and Pierce 1977), it is apparent that the large-bodied mosquitoes contact more hosts. Therefore, large-bodied mosquitoes may play a more important role in the maintenance and amplification of mosquito-borne pathogens than smaller individuals, and a mosquito population with a large average body size may have a higher vectorial capacity than a population with a small average body size.

It is essential that research into mosquito control procedures, particularly those involving predators or other biological agents, include an ecological assessment of the larval habitat. Control measures that do not approach 100% mortality may result in reduced competition for food in the larval habitat, and in the production of a mosquito population with a larger average size and possibly a higher vectorial capacity than had the control measures not been applied (Agudelo-Silva and Spielman 1984).

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