

## Effects of environmental conditions on the movement patterns of *Aedes aegypti* (Diptera: Culicidae) into and out of experimental huts in Thailand

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Received 28 April 2009; Accepted 2 September 2009

**ABSTRACT:** Mark-release-recapture experiments with *Aedes aegypti* were performed using experimental huts equipped with entrance and exit traps to evaluate their movement patterns during a two-year period in Thailand. Results indicate no significant differences in the patterns of movement between the two years of observation. Movement into the huts occurred during the early morning period (06:00-11:00) with a peak at 07:00 in the summer and rainy season and 09:00 in the winter. In contrast, the exit pattern was observed during the late morning (09:00-12:00) and early afternoon (12:00-16:00), with a peak at 16:00 in the winter, 11:00 in the summer, and 14:00 in the rainy season. Multiple regression analysis indicated that movements of *Ae. aegypti* females into and out of the huts were impacted by humidity and temperature during the day. *Journal of Vector Ecology* 34 (2): 267-275. 2009.

**Keyword Index:** *Aedes aegypti*, movement patterns, behavior, experimental hut, Thailand.

### INTRODUCTION

Dengue viruses are transmitted from human to human by the bite of infected *Aedes aegypti* (L), a day-biting mosquito that breeds in or near human dwellings and preferentially feeds on humans even when other warm-blooded animals are freely available (Edman et al. 1992, Xue et al. 1995, WHO 1999). Because no commercial vaccine or successful drug therapy is yet available for the prevention and treatment of dengue infection, the control of the vector remains the most effective method for preventing dengue virus transmission and averting epidemics (Reiter and Gubler 1997, Perich et al. 2001). Control of the mosquito vector by chemical means remains the most successful method for reducing disease transmission and preventing human vector contact (Roberts et al. 1997, WHO 1999).

Chemicals may protect humans from the bite of insects through three different actions; irritancy, repellency, or toxicity (Grieco et al. 2007). Recently, it has been proposed that some chemicals, such as DEET, elicit a fourth action by effectively masking the presence of a host through the inhibition of odor-activated receptors (Ditzen et al. 2008). Most studies have concentrated on the toxic actions of these chemicals, whereas little focus has been placed on non-toxic properties of these compounds. Non-toxic actions can be placed into two different categories, contact irritancy and non-contact repellency (Roberts et al. 1997, Chareonviriyaphap et al. 1997). These two types of behavioral response can be evaluated through the use of laboratory and field assay systems (Roberts et al. 1997, Smith 1965, Chareonviriyaphap et al. 2005, Grieco et al.

2007). In order to truly quantify these behaviors in response to chemical treatments, a baseline of natural behaviors and movement patterns must first be established in the absence of the chemical. Recently, the effect of host types on movement patterns of *Ae. aegypti* using experimental huts was conducted in Thailand (Suwonkerd et al. 2006). These same experimental huts were also used to investigate the three actions of chemicals against *Ae. aegypti* (Grieco et al. 2007). As seen with these previous studies, most experimental hut work evaluates the impact of some type of intervention on mosquito behavior but little has been done to evaluate the movement patterns of *Ae. aegypti* in response to monthly changes in environmental factors. This study was the first attempt to investigate the ingress and egress movements of *Ae. aegypti* in response to changes in seasonal environmental parameters, i.e., relative humidity and ambient temperature, during a two-year period using experimental huts fitted with entrance and exit traps.

### MATERIALS AND METHODS

#### Study site

This study was conducted at Pu Teuy Village, Sai Yok District, Kanchanaburi Province (14° 20'N, 98° 59'E, 304 m asl), western Thailand, approximately 150 km northwest of Bangkok. The site is located in a hilly area and is largely surrounded by primary dense forest. The study site belongs to the Armed Forces Development Command in the Ministry of Armed Forces. The nearest home is approximately 800 m away from the field site where the experimental huts were located.