Journal of the American Mosquito Control Association, 27(3):217–226, 2011

LOCOMOTOR BEHAVIORAL RESPONSES OF *ANOPHELES MINIMUS* AND *ANOPHELES HARRISONI* TO ALPHA-CYPERMETHRIN IN THAILAND

NARITSARA MALAITHONG,[1] RUNGARUN TISGRATOG,[1] KRAJANA TAINCHUM,[1] ATCHARIYA PRABARIPAI,[2] WARAPORN JUNTARAJUMNONG,[1] MICHAEL J. BANGS[3] AND THEERAPHAP CHAREONVIRIYAPHAP[1,4]

ABSTRACT. Excito-repellency responses of 3 test populations, representing 2 sibling species within the Minimus Complex, *Anopheles minimus* and *An. harrisoni*, were characterized for contact irritant and noncontact repellent actions of chemicals during and after exposure to α-cypermethrin at half the recommended field (0.010 g/m^2), the recommended field (0.020 g/m^2), and double the recommended field concentration (0.040 g/m^2), using an excito-repellency escape chamber system. Two field populations of *An. minimus* and *An. harrisoni* collected from the malaria-endemic areas in Tak and Kanchanuburi provinces in western Thailand, respectively, were tested along with a laboratory population of *An. minimus* maintained since 1993. Females of all 3 test populations rapidly escaped after direct contact with treated surfaces for each concentration. In general, increased escape responses in the *An. minimus* test populations were proportionate to increased insecticide dosages. The greatest escape response for *An. harrisoni* was observed at the operational field concentration of α-cypermethrin. The noncontact repellency response to α-cypermethrin was comparatively weak for all 3 test populations, but significantly different from each paired contact test and respective noncontact controls. We conclude that strong contact irritancy is a major action of α-cypermethrin, whereas noncontact repellency plays no role in the escape responses of 2 species in the Minimus Complex in Thailand.

KEY WORDS *Anopheles minimus*, *Anopheles harrisoni*, behavior, alpha-cypermethrin, excito-repellency

INTRODUCTION

In spite of significant achievements in malaria control in the past decades, approximately 30,000–40,000 confirmed malaria cases occur in Thailand annually. Malaria remains prevalent along the relatively undeveloped borders between Thailand and eastern Myanmar, northern Malaysia, and western Cambodia (Chareonviriyaphap et al. 2000; DDC 2006, 2010). Approximately 70% of all malaria cases are reported along the Myanmar border where the *Anopheles minimus* complex is abundant and plays an important role in disease transmission (DDC 2010, Manguin et al. 2010).

Two sibling species, *An. minimus* Theobald and *An. harrisoni* Harbach and Manguin, within the Minimus Complex are found in sympatry in Pu Teuy Village, Kanchanaburi Province, western Thailand (Sungvornyothin et al. 2006b, Manguin et al. 2010). *Anopheles minimus* has a much wider geographic distribution and is a primary vector of malaria throughout much of its range, whereas *An. harrisoni* is more restricted and focal in occurrence and appears to play a more minor role in malaria transmission (Manguin, personal communication). In Thailand, vector control has been a primary method for malaria abatement. For decades, DDT was used for indoor residual spraying (IRS) but was withdrawn in 2000 based on perceived adverse impact on the environment and reports of changing behavioral response of mosquito vectors to the chemical (Ismail et al. 1975, Bang 1985, Chareonviriyaphap et al. 2000). Various synthetic pyrethroids have since gained general acceptance in Thailand for use in re-treatment of bed nets (permethrin) and for IRS (deltamethrin) (Patipong 2000, DDC 2010). The prospect of continuing wide-scale use of pyrethroid compounds is a major stimulus for continuing studies on the effectiveness and impact of residual deposits on treated surfaces on mosquito vector behavior in Thailand.

A better understanding of the behavioral responses of individual species within the complex will facilitate vector control by selecting and implementing the most sustainable and effective interventions possible (Chareonviriyaphap et al. 2004, Sungvornyothin et al. 2006b, Polsomboon et al. 2008). Previous studies on behavioral responses of mosquitoes to chemicals has emphasized the importance of excitation and repellency (“avoidance behavior”) as having a critical role in mosquito-borne disease prevention (Roberts et al. 2000; Chareonviriyaphap et al. 2001; Pothikasikorn et al. 2005; Thanispong et al. 2009, 2010). In general, behavioral responses can be categorized

[1] Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok, 10900 Thailand.

[2] Department of Statistics and Computer, Faculty of Liberal Arts and Science, Kasetsart University, Kamphaengsean, Nakhon Pathom, 73140 Thailand.

[3] Public Health and Malaria Control Department, PT Freeport Indonesia, Jl. Kertajasa, Kuala Kencana, Papua 99920, Indonesia.

[4] To whom correspondence should be addressed.