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Species diversity and biting activity of *Anopheles dirus* and *Anopheles baimaii* (Diptera: Culicidae) in a malaria prone area of western Thailand

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Abstract

Background: A survey of adult anopheline mosquito diversities, collected from September 2009 to August 2010, was conducted in a malaria endemic area of western Thailand. Two anopheline species complexes, Dirus and Minimus, along with the Maculatus group were observed. Of several species documented from within each complex and group, four important malaria vectors were identified, including *An. dirus*, *An. baimaii*, *An. minimus*, and *An. sawadwongporni*. Information on biting activity and host preference for any single species within the Dirus complex has never been assessed. Using specific molecular identification assays, the trophic behavior and biting activity of each sibling species within the Dirus complex were observed and analyzed for the Kanchanaburi Province, Thailand.

Methods: Adult female mosquitoes were collected for two consecutive nights each month during a one year period. Three collection methods, human landing indoor (HLI), human landing outdoor (HLO), and cattle baited collections (CBC) were applied. Each team of collectors captured mosquitoes between 1800 and 0600 h.

Results: From a total of 9,824 specimens, 656 belong to the Dirus complex (*An. dirus* 6.09% and *An. baimaii* 0.59%), 8,802 to the Minimus complex (*An. minimus* 4.95% and *An. harrisoni* 84.65%) and 366 to the Maculatus group (*An. maculatus* 2.43% and *An. sawadwongporni* 1.29%). Both *An. dirus* and *An. baimaii* demonstrated exophagic and zoophilic behaviors. Significantly greater numbers of *An. dirus* and *An. baimaii* were collected from cattle as compared to humans ($P=0.003$ for *An. dirus* and $P=0.048$ for *An. baimaii*).

Conclusions: Significantly greater numbers of *An. dirus* and *An. baimaii* were collected from cattle baited traps as compared to human landing collections ($P < 0.05$), demonstrating that both species show a strong zoophilic behavior. Knowledge of host-seeking behavior helps to define a species' capacity to acquire and transmit malaria and its contribution to the overall risk for disease transmission in the human population, as well as, assisting in the design and implementation of appropriate vector prevention and control strategies.

Keywords: *Anopheles dirus*, *Anopheles baimaii*, Exophagic, Zoophilic, Thailand

Background

In Thailand, malaria remains one of the most important infectious diseases despite years of well-organized disease control in reducing both mortality and morbidity country-wide [1]. Seventy percent of the malaria cases are documented from the relatively undeveloped borders and hill

region of eastern Myanmar, whereas the three species complexes, i.e. *Anopheles dirus*, *An. minimus*, and *An. maculatus* are commonly present and some of them are considered as important malaria vectors, including *An. dirus*, *An. baimaii*, *An. maculatus*, *An. sawadwongporni* and *An. minimus* [2,3].

Better understanding of the behavior of each sibling species within the complex is quite important to help identify their respective roles in disease transmission and to assist the vector control personnel in designing the appropriate steps for vector control management.

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