

SEASONAL ABUNDANCE AND BLOODFEEDING ACTIVITY OF *ANOPHELES DIRUS* SENSU LATO IN WESTERN THAILAND

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ABSTRACT. Bloodfeeding activity, host preference, and seasonal abundance of the *Anopheles dirus* complex in relation to environmental factors were measured during a 2-yr period at Pu Teuy Village, Sai Yok District, Kanchanaburi Province, western Thailand. *Anopheles dirus* s.l. was found more abundant during the wet season compared with the dry and hot seasons. Bloodfeeding by *An. dirus* s.l. commenced immediately after sunset with a distinct peak of activity at 2000 h. *Anopheles dirus* s.l. fed more readily on cattle than on humans, demonstrating a significant but slightly stronger zoophilic behavior ($P = 0.02$). The biting activity of *An. dirus* s.l. in Pu Teuy appears to differ from other localities in Thailand, suggesting the existence of significant biological variability within the species complex depending on the local circumstances.

KEY WORDS *Anopheles dirus*, biting frequency, abundance, Thailand

INTRODUCTION

Several vector-borne diseases are widely distributed in Thailand, including malaria, dengue, and lymphatic filariasis. Among these, malaria remains one of the most important infectious diseases, primarily concentrated in forested areas along the western border with Myanmar, the eastern border with Cambodia, and the southern border with Malaysia (Chareonviriyaphap et al. 2000, Ministry of Public Health [MOPH] 2006). Approximately 70% of the country's malaria cases are documented from the border areas with Myanmar, where the combination of malaria-infected migrants and efficient malaria vectors such as *Anopheles dirus* Peyton and Harrison complex species commonly coexist (MOPH 2006). For example, the border province of Tak has reported between 3,000 and 25,000 cases annually over the last 10 yr. The *An. dirus* complex is primarily a collection of forest and forest-fringe inhabiting mosquitoes, some of which are considered highly endophagic and anthropophilic, with sufficiently high malarial infectivity rates to maintain transmission year-round (Ismail et al. 1974, Rosenberg and Maheswary 1982, Baimai 1988, Baimai et al. 1988). Early recognition of this species' (known

until 1979 as *Anopheles balabacensis* Baisas) importance in transmitting malaria in Thailand subsequently led to many field and laboratory studies to discern adult behavioral patterns in relation to transmission and response to control measures (Scanlon and Sandhinand 1965; Wilkinson et al. 1970; Ismail et al. 1974, 1975; Kitthawee et al. 1990; Suwonkerd et al. 1990; Rattananarithikul et al. 1996a, 1996b; Chareonviriyaphap et al. 2004).

Two complexes within the Leucosphyrus group are recognized, including 7 species in the Dirus complex (*An. baimaii* Sallum and Peyton, *An. cracens* Sallum and Peyton, *An. dirus*, *An. elegans* (James), *An. nemophilous* Peyton and Ramalinham, *An. scanloni* Sallum and Peyton, and *An. takasagoensis* Morishita) and 4 species in the Leucosphyrus complex (*An. balabacensis* Baisas, *An. introlatus* Colless, *An. latens* Sallum and Peyton, and *An. leucosphyrus* Doenitz (Peyton 1989, Sallum et al. 2007, Manguin et al. 2008). Unlike most species in the group that have infrequent contact with humans, a few members are regarded as excellent malaria vectors because of their highly endophagic and anthropophilic behavior. Five species within the Dirus complex are present in Thailand; 4 of them, *An. dirus* s.s. (former *An. dirus* A), *An. cracens* (species B), *An. scanloni* (species C), and *An. baimaii* (species D), are regarded as malaria vectors with sporozoite rates of up to 10% (Peyton 1989, Sallum et al. 2005). However, only *An. baimaii* and *An. dirus* are considered to be among the most important primary malaria vectors in Thailand (Rattananarithikul et al. 2006, Manguin et al. 2008). Unpublished field data in western Thailand have shown *An. dirus* and *An. baimaii* are closely associated with increased rainfall and high relative humidity, and the most preferred breeding habitats are shaded animal footprints, wheeltracks, and temporary ground pools, thus making

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