



## Vector-Borne Diseases, Surveillance, Prevention

# Trophic Behavior and Species Diversity of the *Anopheles barbirostris* Complex (Diptera: Culicidae) in Thailand

Chanya Udom,<sup>1,✉</sup> Kanutcharee Thanispong,<sup>2</sup> Sylvie Manguin,<sup>3,✉</sup>  
Theeraphap Chareonviriyaphap,<sup>4,✉</sup> and Wirasak Fungfuang<sup>1,5</sup>

<sup>1</sup>Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, 10900, Thailand, <sup>2</sup>Bureau of Vector-Borne Diseases, Department of Disease Control, Ministry of Public Health, Nonthaburi, 11000, Thailand, <sup>3</sup>HSM, Univ. Montpellier, CNRS, IRD, Montpellier, France, <sup>4</sup>Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok, 10900, Thailand, and <sup>5</sup>Corresponding author, e-mail: [fsciwsf@ku.ac.th](mailto:fsciwsf@ku.ac.th)

Subject Editor: Richard Wilkerson

Received 13 August 2020; Editorial decision 20 March 2021

### Abstract

Species of the *Anopheles barbirostris* complex (Myzorhynchus Series of the subgenus *Anopheles*) are potential vectors of malaria and filariasis parasites. Owing to the lack of reliable identification methods, the biting activity and host preference of the species within this complex have not been previously described. In this study, the trophic behavior and host preferences of the species in the complex were determined in Thailand, and a map of their geographical distributions constructed. Adult female mosquitoes in Chanthaburi and Prachuap Khiri Khan provinces were collected using human landings (indoor and outdoor) and cow-bait. Morphological characters were used to initially identify the mosquitoes, and then, species were further separated by multiplex PCR. Four species were identified in the *An. barbirostris* complex: *An. wejchoochotei* Taai & Harbach (Diptera: Culicidae), *An. saeungae* Taai & Harbach (Diptera: Culicidae), *An. dissidens* Taai & Harbach (Diptera: Culicidae), and *An. campestris* Reid (Diptera: Culicidae). The species showed exophagic and zoophilic behavior, except *An. wejchoochotei* in Chanthaburi, which displayed slight endophilic behavior. Indoor and outdoor blood feeding behavior of *An. wejchoochotei* and *An. saeungae* peaked at 2000 h. An updated distribution map of the *An. barbirostris* complex in Thailand is presented. With a better understanding of the sibling vector species and their spatial distributions, more specific and effective control strategies for vectors of malaria and filariasis in Thailand can be achieved.

**Key words:** *Anopheles barbirostris*, species complex, sibling species, trophic behavior, Thailand

Several Asian countries documented a greater than 75% reduction in the incidence of confirmed malaria cases between 2000 and 2014 (WHO 2018). The Maldives and Sri Lanka were declared ‘malaria-free’ in 2015 and 2016, respectively (WHO 2018), and Bhutan and Timor-Leste have reported no malaria-related deaths since 2013 and 2015, respectively, with no malaria cases in Timor-Leste since 2017 (WHO 2018). Countries are eliminating malaria and hope to be malaria-free, including Thailand by 2024, Nepal and Timor-Leste by 2025, and Bangladesh, Myanmar, Indonesia, and India by 2030 (WHO 2018). However, in 2017, Cambodia reported 50,000 malaria cases, a 95% increase from the 23,627 cases in 2016 (Tananchai et al. 2019a). This increase is in contrast to the negative trends in most countries of the Greater Mekong Subregion and the Asian

continent (Edwards et al. 2019, Kaehler et al. 2019). Therefore, malaria surveillance systems must be continuously strengthened in malaria-free countries to serve as a cornerstone of national programs to prevent the ongoing risk of reintroduction.

In 2016 in Thailand, the National Malaria Control Program (NMCP) determined that local malaria transmission continued to occur in 215 (23%) of the 928 districts and in 2,769 (3%) of the 89,761 villages. The NMCP’s data showed a continual decline in the number of villages with local transmission, which decreased from 5,502 in 2015 to 2,741 in 2017 (of which 1,116 were classified as active foci) (Bureau of Vector Borne Diseases (BVBD) 2019). Moreover, malaria cases decreased from 24,840 in 2015 to 6,625 cases in 2018. By 2015, Thailand experienced drastic reductions in