

Effect of different habitat types on abundance and biting times of *Anopheles balabacensis* Baisas (Diptera: Culicidae) in Kudat district of Sabah, Malaysia

ABSTRACT

We investigated the effect of five common habitat types on the diversity and abundance of *Anopheles* spp. and on the biting rate and time of *Anopheles balabacensis* (currently the only known vector for *Plasmodium knowlesi* in Sabah) at Paradason village, Kudat, Sabah. The habitats were forest edge, playground area, longhouse, oil palm plantation and shrub-bushes area. Sampling of *Anopheles* was done monthly using the human landing catch method in all habitat types for 14 months (October 2013 to December 2014, excluding June 2014). The *Anopheles* species were morphologically identified and subjected to PCR assay for the detection of *Plasmodium* parasites. Generalised linear mixed models (GLMM) were applied to test the variation in abundance and biting rates of *An. balabacensis* in different habitat types. A total of 1599 *Anopheles* specimens were collected in the village, of which about 90% were *An. balabacensis*. *Anopheles balabacensis* was present throughout the year and was the dominant *Anopheles* species in all habitat types. The shrub bushes habitat had the highest *Anopheles* species diversity while forest edge had the greatest number of *Anopheles* individuals caught. GLMM analysis indicated that *An. balabacensis* abundance was not affected by the type of habitats, and it was more active during the early and late night compared to predawn and dawn. PCR assay showed that 1.61% of the tested *An. balabacensis* were positive for malaria parasites, most of which were caught in oil palm estates and infected with one to two *Plasmodium* species. The identification of infected vectors in a range of habitats, including agricultural and farming areas, illustrates the potential for humans to be exposed to *P. knowlesi* outside forested areas. This finding contributes to a growing body of evidence implicating environmental changes due to deforestation, expansion of agricultural and farming areas, and development of human settlements near to forest fringes in the emergence of *P. knowlesi* in Sabah.