

Forecasting a risk map of Culex mosquito abundance in Hanoi, Vietnam

Tuyen Van¹, Wonkook Kim¹, Thang Nguyen-Tien¹, Johanna Lindahl², Hung Nguyen-Viet¹, Nguyen Quang Thi¹, Huy Van Nguyen¹, Fred Unger³, and HUSUK LEE⁴

¹Affiliation not available

²International Livestock Research Institute (ILRI)

³ILRI

⁴International Research Livestock Institute, VN

March 30, 2022

Abstract

Japanese encephalitis (JE) is the major cause of viral encephalitis (VE) in most Asian-Pacific countries. In Vietnam, there is no nationwide surveillance system for JE due to lack of medical facilities and diagnoses. *Culex tritaeniorhynchus*, *Culex Vishnui*, and *Culex quinquefasciatus* have been identified as the major JE vectors in Vietnam. The main objective of this study was to forecast a risk map of *Culex* mosquitoes in Hanoi, which is one of the most densely populated cities in Vietnam. A total of 10,775 female adult *Culex* mosquitoes were collected from 513 trapping locations. We collected temperature and precipitation information during the study period and its preceding month. In addition, the other predictor variables (e.g., normalized difference vegetation index [NDVI], land use/land cover and human population density), were collected for our analysis. All the collected data was pre-processed with the same study extent and spatial resolution of 30 m. The final model selected for estimating the *Culex* mosquito abundance included centered rainfall, quadratic term rainfall, rice cover ratio, forest cover ratio, and human population density variables. The estimated spatial distribution of *Culex* mosquito abundance ranged from 0 to 200. Our model estimated that 87% of the Hanoi area had an abundance of mosquitoes from 0 to 50, whereas approximately 1.2% of the area showed more than 150 mosquitoes, which was mostly in the rural/peri-urban districts. Our findings may provide better insight into understanding the spatial distribution of *Culex* mosquitoes and its associated environmental risk factors. Such information can assist local clinicians and public health policymakers to identify the potential areas of risk for JE virus. Risk maps can be an efficient way of raising public awareness about the virus and further preventive measures need to be considered in order to prevent outbreaks and onwards transmission of the JE virus.

Hosted file

JE_manuscript.docx available at <https://authorea.com/users/471432/articles/562881-forecasting-a-risk-map-of-culex-mosquito-abundance-in-hanoi-vietnam>

Hosted file

Figure 1_3.docx available at <https://authorea.com/users/471432/articles/562881-forecasting-a-risk-map-of-culex-mosquito-abundance-in-hanoi-vietnam>

Hosted file

Table 1_2.docx available at <https://authorea.com/users/471432/articles/562881-forecasting-a-risk-map-of-culex-mosquito-abundance-in-hanoi-vietnam>