Biology and Medicine Through Mathematics Conference

2018

May 31st, 6:00 PM - 6:30 PM

Modeling and Predicting the Invasive Mosquito Abundance in North-East Region of United States

Mohammad A. Al-Mamun
Yale University, mamun19871987@gmail.com

Modeling and Predicting the Invasive Mosquito Abundance in North-East Region of United States

MA Al-Mamun[1], Christine H. DeCarlo[2], Ernest O. Asare[1], and Hussni. O. Mohammed[2]
1Department of Epidemiology of Microbial Diseases, Yale School of Public Health, New Haven, Connecticut, USA;2 Cornell University, Ithaca, New York, USA;

Abstract

Identifying the spectrum of vectors that play a role in perpetuating vector-borne infections in endemic foci that will help in controlling the spread of the disease. *Aedes* mosquito complex are invasive/non-native in North America and have the potential to be a vector of different arboviruses including WNV, Zika, Dengue, and Chikungunya Japanese encephalitis. It is already shown that *Ae japonicas, Ae. albopictus,* and *Ae. Aegypti,* are involved in transmitting arboviruses in Northeast region of US while all of them are temperature tolerant and opportunistic biter. There is significant knowledge gap how these species survive under different extreme climatic conditions especially temperature and rainfall. It is pausible to mention that temperature can be linked to both the atitudinal boundary and upper elevational limit of pathogen transmission if the extrinsic incubation period (EIP) is greater than the longevity of the vector and also changes in the intensity of transmission of pathogens. In this paper, we modified a dynamic mathematical model named VECtri of mosquito abundance while considering temperature an rainfall impacts on various aspects of *Ae. albopictus*. The model considers the mosquito life cycle: eggs, larvae, pupa and adult. The adult mosquitos lay eggs, afterward larvae and then become pupa after which adult emerges from the container or surface. We chose mosquito abundance of *Ae. albopictus* from Connecticut (CT) from 2013-2016. We retrieved temperature and rainfall data from four weather stations in CT: Sikorsky Airport, Meriden Markham Municipal Airport, Bridgeport, Success Hill and Tweed Airport. The model is simulated using individual station data and fitted against the *Ae. albopictus* abundance in CT. Overall, both field data and model results provide insights about the abundance of *Aedes* species and the impact of environmental factors on this non-native vector population. This model can be used for predicting abundance of other critical mosquito species by feeding the real life data.

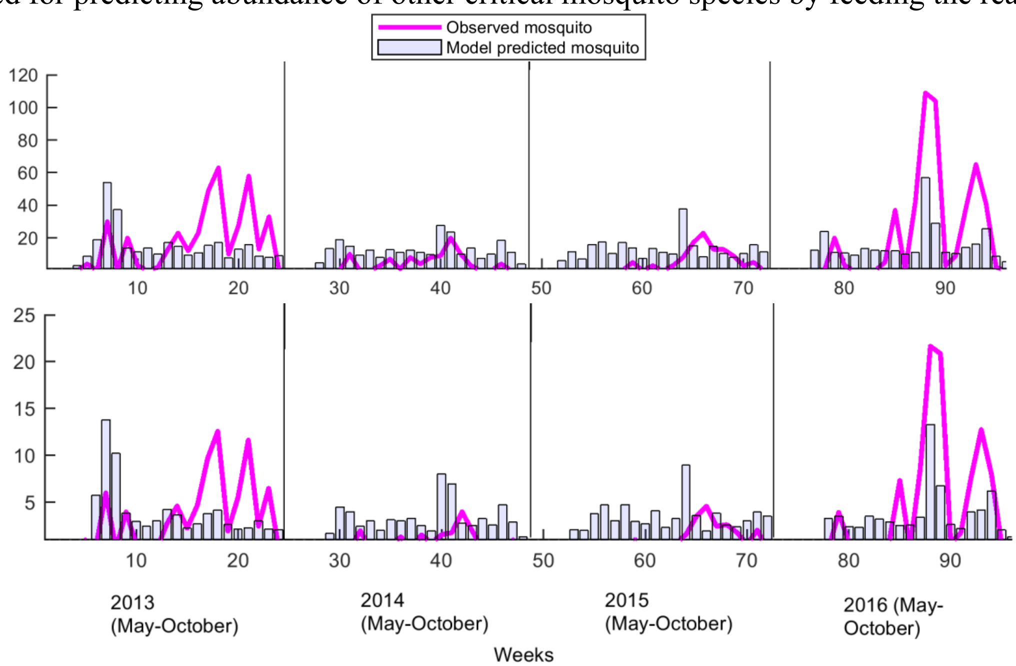

Figure 1. The fitting of mosquito abundance of CT (a)Larvae abundance, (b)*Ae. albopictus* abundance.