

Review Article

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Seasonal Dynamics and Habitat Characteristics of Mosquito Populations in a Tropical Environment

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Abstract Mosquito populations in tropical environments exhibit marked seasonal dynamics shaped by climatic variability, habitat availability, and human disturbance. This paper examines how temperature, rainfall, humidity, and ecological conditions influence temporal changes in mosquito abundance and distribution, with particular attention to the relationship between seasonal patterns and habitat characteristics. Both natural habitats, such as wetlands, ponds, and vegetated areas, and artificial habitats, including urban containers, drainage systems, and domestic water storage sites, are considered in order to understand their roles in sustaining mosquito breeding and survival. The study also explores species-specific responses to environmental drivers, showing that different mosquito taxa vary in their seasonal peaks and habitat preferences. In addition, the paper reviews commonly used field sampling methods, statistical analyses, and spatial tools such as geographic information systems and remote sensing for monitoring mosquito populations and identifying high-risk habitats. The findings highlight that seasonal mosquito dynamics in tropical regions are closely linked to habitat heterogeneity and environmental change, which together affect the risk of vector-borne disease transmission. A better understanding of these interactions can support more targeted habitat management and seasonally optimized mosquito control strategies for improving public health outcomes in tropical settings.

Keywords Mosquito populations; Tropical environments; Seasonal dynamics; Habitat characteristics; Vector control

1 Introduction

Mosquitoes play a critical role in tropical regions as vectors of numerous infectious diseases that significantly impact public health worldwide. Tropical climates, characterized by warm temperatures and high humidity, provide ideal conditions for mosquito breeding and survival, facilitating the transmission of pathogens such as dengue, malaria, Zika, and chikungunya viruses. The burden of these vector-borne diseases is particularly severe in tropical areas due to the year-round presence of mosquitoes and the complex interactions between environmental factors and mosquito biology. Understanding mosquito population dynamics in these regions is essential for developing effective control strategies to reduce disease transmission and protect vulnerable populations (Blanco-Sierra et al., 2024; García-Suárez et al., 2024).

Research on mosquito ecology in tropical environments has advanced considerably, focusing on how seasonal changes and habitat characteristics influence mosquito abundance and species composition. Studies have demonstrated that climatic variables such as temperature, rainfall, and humidity are major drivers of mosquito life cycles, affecting their reproduction, development, and survival rates. Additionally, anthropogenic factors like urbanization alter habitat availability and quality, influencing mosquito community structure and vector potential. Recent modeling efforts have integrated environmental data with mosquito life history traits to predict spatiotemporal population dynamics across diverse tropical landscapes. These approaches highlight the importance of local-scale ecological studies to capture the variability in mosquito populations driven by both natural seasonality and human-induced habitat changes (García-Suárez et al., 2024; Rakotoarison et al., 2025).

This study aims to elucidate the seasonal dynamics and habitat characteristics of mosquito populations within a tropical environment to inform vector control efforts. By characterizing how environmental variables and habitat types affect mosquito abundance and diversity over time, this research seeks to identify key factors that govern