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The Effects of *Culicidae* (Diptera) Larvae on Public Health

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Abstract

Entomological surveys conducted in transitional situations, the adaptability of mosquitoes, and their participation in the transportation of infectious organisms are crucial for determining the risk they provide to public health. The *Culicidae*-insects, which may establish themselves in urban centres and exist in regions with remnant woods, are among the main vectors of the infectious agents responsible for the occurrence of significant arboviruses, like dengue, for example. In the municipality of Santa Barbara D'Oeste, So Paulo, Brazil, mosquito species were surveyed using traps set to catch their larvae in five rural regions that were part of the Atlantic Forest domain and contained its remnant vegetation. On 920 instances, a total of 13,241 larvae from six different mosquito species were gathered (32.52% of positive collections). The two most prevalent species were *Aedes albopictus* (64.23%) and *Aedes aegypti* (32.75%), followed by *Culex quinquefasciatus* (1.32%), *Aedes fluviatilis* (1.04%), *Culex Complex Coronator* (0.40%), and *Toxorhynchites theobaldi* (0.22%). Simpson's diversity index was used to evaluate three places, and the spatial analysis revealed that the locations with the highest concentrations of *Ae. aegypti* had lower diversity values and were linked to more densely packed metropolitan areas. The vector of dengue, chikungunya, and zika has a strong ability to infest urban settings, so it is crucial to start entomological surveillance and control actions as soon as possible in particular locations, like transitional ones.

Keywords: Zika; Chikun gunya; Entomological; Disease

Introduction

Certain types of mosquitoes spread infections and aid in the global spread of disease. Given the severity and societal effects of diseases like dengue, chikungunya, and zika in Brazil, which are all arboviruses spread by the same common vector, this is one of the most significant expenditures made in the nation's public health sector. This highlights how crucial it is to monitor *Culicidae* vector species distribution and dynamics in both endemic and non-endemic locations. Thus, it is believed that ecological dynamics and relationships between mosquito species are significant for medical entomology, particularly in situations when urban and rural habitats are transitioning. Interspecific competition and environmental factors may change one species' dominance over others in these places, fostering conditions favourable for the spread of diseases and, as a result, the development of disease outbreaks and epidemics among the surrounding human population [1, 2].

These transitional regions may not gain as much from vector control efforts as when these are carried out on the fringes of cities because one is not dealing with consolidated metropolitan areas here. In this context, entomological surveillance is of utmost importance. Among the most effective and sensitive techniques for tracking mosquitoes are ovitraps and larvitraps, both of which are extensively employed and have a remarkably simple manner of implementation. Since it helps to increase understanding of the patterns of occupation and enables the creation of control tactics tailored to the specific species, entomological surveillance is crucial for monitoring mosquito populations in rural regions. Additionally, the interpolation of the mosquito diversity depicted on the created maps enables the distinguishing of the diversity occurring in the various portions of each area as well as the estimation of values in the places where collections have not been conducted. By using larvitraps, our study aims to present the *Culicidae* fauna found in several rural areas of the municipality of Santa Barbara d'Oeste, as well as the species composition in these locations. The locations chosen had the densest populations outside of metropolitan cores, which increases the likelihood that diseases with mosquito-borne etiological agents that are often prevalent in urban areas could manifest in these environments [3-6].

Methods

The municipality of Santa Bárbara d'Oeste, located in the heartland of So Paulo state, at 22.75°S and 49.38°W, with an average altitude of 560 m, was the site of the current investigation. The municipality has a total area of about 271 km^2 and a population of about 190,000 people, 98% of whom are centred in the urban region and only 2% of whom reside in the rural area. The municipality has a relief of gently sloping, medium-sized hills and is located among the foothills of the *Depresso Periférica Paulista*. The region's remaining vegetation is found in a biome transition zone between the Savannah and Atlantic Forest biomes. Santa Barbara d'Oeste has a climate that falls under Koeppen's proposed classification [7].

Analysis

Data on the positive of the mosquito species were entered into a spatial information plane created from the geo-referenced locations of the traps in a Geographic Information System. The geo-relational model, which ensures a connection between the geographic characteristics and the table of attributes, maintains a correspondence between the space and the register of attributes by using a single identifier to connect them. The number of cohabitations and the total number of mosquito species were supplied in a table of qualities together with their hierarchical distributions. This method enables the creation of six theme maps on which the locations with the highest mosquito frequency were noted. A mathematical model for mounting the variability of all the data was

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obtained by estimating semi-variograms of the variety of mosquito species [8].

The variogram is a crucial tool for showing the sample's level of spatial dependency and its particular support. The relationship is represented by two axes: x, which represents the distance vector, and y, which stands for variance or covariance. Given that the sites were randomly selected and the discovery of the larvae and species was accidental, the semi-variograms in this study help to confirm the absence of spatial connection and contribute to the validation of the experimental model of collection [9].

Conclusion

The study's most often encountered species was *Ae. albopictus*, which represented 95.5% of times it was discovered among other species and 67.68% of times it was discovered alone (with just one species present during the collection). Taking into account both circumstances, the larvae of this species made up 64.23% of the total discovered. In the locations under study, the other *Culicidae* species were uncommon. The next most prevalent species were *Ae. fluviatilis*, Cx. Coronator Complex, and *Tx. theobaldi*, with *Culex quinquefasciatus* coming in third geographic distribution of *Culicidae* species in Cruzeiro's districts. Santo Antônio do Sapezeiro and Glebas, California, were excluded from the graphic depictions of the estimates of diversity since there were insufficient samples from those places to map the distribution of the species there [10].

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Conflict of Interest

None

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