Mosquito Resting Behavior: A Systematic Review and Meta-Analysis

499 Progress Report

I have been working on this project for *1* semester.

I have been in Biol 499R for *1* semester.

Fall 2020

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Abstract

Vector-borne diseases represent a critical public health concern and understanding mosquitos' behavior is essential in implementing effective vector-control policies in communities. There has been extensive research on mosquitos' resting behavior on surfaces, height, and location preference. However, there is still a need to comprehend resting behavior patterns among mosquitos, particularly given many vector control interventions such as bednets or indoor residual spraying capitalize on mosquito resting. In this analysis, we gathered the available scientific data in order to study and analyze mosquito resting behavior holistically. Primary studies were gathered in Pubmed, Web of Science, and Zoological Record databases and were further categorized within our inclusion criteria. Patterns are expected to be found in categories such as surface of rest, height of rest, indoor/outdoor preferences, and insecticide resistance incidence. We expect that this analysis will bring clarity to mosquitos' behavioral patterns in resting and to their species-specific behavior.

1 Introduction

Vector-borne diseases cause more than 700,000 deaths annually and account for a substantial percentage of all infectious diseases (WHO, 2020), and are thus a vital component of public health concerns. Mosquitos are a common vector that transmit diseases such as malaria, dengue, Zika, chikungunya among many others. Understanding mosquitos' behavior and their niches is essential in disease control, a preventive medicine issue, and has been evaluated as is a key aspect in vector control policies (WHO, 2017).

One key aspect of mosquito behavior is their resting habits. There has been extensive research analyzing and finding patterns in mosquitos' preferences in resting. Although many previous studies have evaluated a variety of single aspects of mosquito resting behavior, there is still a need for a holistic comprehension of mosquitos resting patterns. Systematic reviews gather available literature and primary data within the field of interest, in this case, mosquito resting behavior. This research will incorporate this exhaustive data collection of mosquitos' resting behavior, and through statistical modeling, perform a meta-analysis that will allow a comprehensive look into mosquito resting behaviors patterns. In this analysis, we gathered overarching data in how, when, and where mosquitoes usually rest and conducted a systematic review to comprehend the many branches of studies that have been developed within this field.

We performed a systematic review of a broad range of aspects in resting behavior such as: surface preference, time analysis, outdoor and indoor resting, height of rest, and insecticide resistance incidence. This study intends to gather, analyze, and bring further clarity towards this aspect of mosquitos' niche. This systematic review will hopefully assist further studies on what aspects of mosquito resting behavior still need further research and also lead to more effective planning and implantation of vector control policies.

2 Methods

2.1 Reference Gathering

We searched PubMed, Zoological Record, and Web of Science databases for records involved in mosquito resting behavior. The following search terms were used: resting, rest*, behavior, behavio*r, mosquitos, and mosquito*. 183 records were identified through this initial database search. Additional potentially relevant sources were included through mosquito resting literature

search. All of the records identified were added to Endnote reference manager and duplicates were removed (Figure 1).

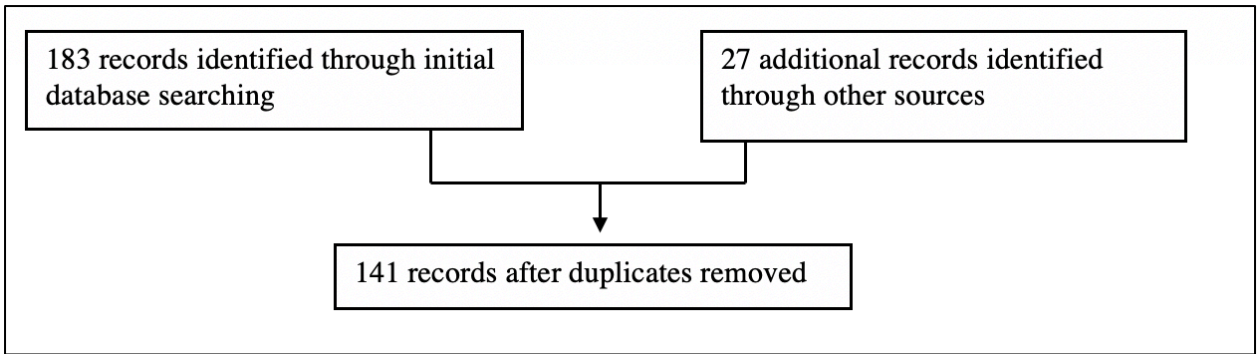

Figure 1: Flowchart of paper selection process in this study

2.2 Inclusion/Exclusion criteria

Studies, papers or publications that did not include any primary data or insufficient data regarding mosquito resting behavior were excluded from the systematic review. Records that had no specification regarding the species of mosquito in which resting behavior was researched, were also not considered.

2.3 Data Analysis

The former records were divided among a team of ten members for initial analysis of primary data. Through a Google Form, the 141 records were evaluated through a standard questionnaire that included specifications of the species studied and corresponding resting habit (Figure 2).

1. Paper ID (PMID)
2. First Author
3. Year
4. Species (generate this form multiple times if more than one species is studied): full scientific name.
5. Resting habit -check all that apply (this allows to open specific options, #6-8 below)
    a. Indoor (check)
    b. Outdoor (check)
    c. Laboratory (check)
    d. Experimental hut/house (check)
    e. Other:
6. For OUTDOOR habit
    a. Resting surfaces (list)
    b. Resting height (m)
    c. Feeding sources (% catch)
    d. Factors influencing resting (list)
    e. Additional comments (text)
7. For INDOOR habit
    a. Resting surfaces (list)
    b. Resting height (m)
    c. Specific rooms (% catch)
    d. Feeding sources (%)
    e. Factors influencing resting (list)
    f. Additional comments (text)
8. For LABORATORY/EXPERIMENTAL studies
    a. Resting surfaces (list)
    b. Resting height (m)
    c. Feeding sources (% catch)
    d. Factors influencing resting (list)
    e. Additional comments (text)
9. For OTHER (specify)
    a. Resting surfaces (list)
    b. Resting height (m)
    c. Feeding sources (% catch)
    d. Factors influencing resting (list)
    e. Additional comments (text)

Figure 2: Standard questionnaire submitted for each reference

3 Results

Common topics among mosquito resting behavior were observed in the initial database search, including indoor versus outdoor resting; height of rest; surface of rest; time analysis of resting; surface color preference of rest; and resistance incidence. Records identified through initial database searching were divided in regard to the genus of mosquito that the record was researching (Figure 3). Records that did not specify or studied more than one species were included in the "Varied" category.

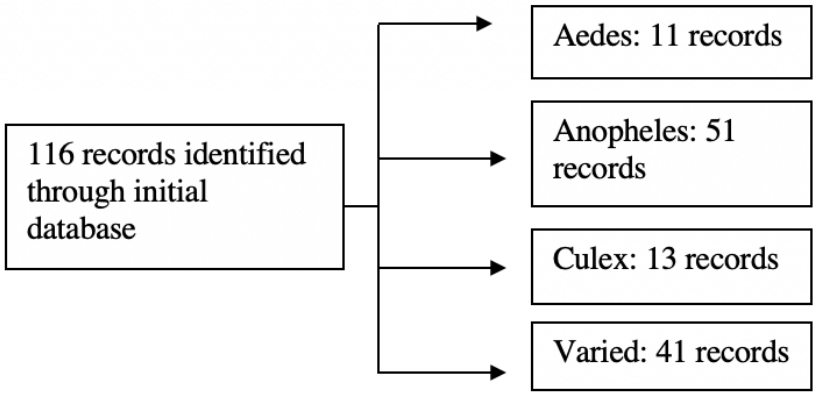

Figure 3: Genus division of initial database search

4 Discussion

The subsequent analysis and data collection will hopefully provide more detailed and substantial understanding of mosquito resting behavior. The following systematic review of the overarching literature available in resting behavior studies will allow not only to comprehend holistically this aspect of mosquitos' niche, but also understand where further research should focus on, and what knowledge is still lacking primary data in mosquito resting patterns.

By summarizing mosquito resting behavioral patterns, this systematic review could impact governmental public health policies in applying vector control methods. The patterns identified in this meta-analysis should serve as a basis for future planning of effective mosquito control actions.

7 References

World Health Organization. (2020). Vector-borne diseases. https://www.who.int/en/news-room/fact-sheets/detail/vector-borne-diseases [Accessed November 2, 2020].

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