How do specific environmental factors, such as temperature influence the population dynamics of adult mosquitoes in a timespan of 10 days?
Team JAAA

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Introduction

We are Team JAAA, and we have chosen the project Mosquito Alert. We have been investigating the life cycle of mosquitoes, exploring methods for prevention, and brainstorming innovative solutions to combat them. We have worked diligently and successfully achieved several goals. Why did we do it: We wanted to have every important topic in the question

Oriëntation

Adult mosquitoes, the reproductive stage of their life cycle, play a crucial role in disease transmission and population growth. They are characterized by slender bodies, elongated mouthparts called proboscis for blood-feeding, and two pairs of wings. Different mosquito species exhibit diverse behaviors and preferences, including feeding habits, resting sites, and flight patterns. Understanding the ecology, behavior, and lifespan of adult mosquitoes is essential for devising effective control measures and combating mosquito-borne diseases. Their interactions with humans and the environment influence disease transmission dynamics and population density.

Mosquitoes exhibit a wide range of breeding site preferences and environmental adaptations. Some species prefer small containers of water, while others thrive in larger ponds or marshes. Breeding sites can include stagnant water sources, such as discarded containers, tree holes, or water catchment areas. Understanding the characteristics of these breeding sites, such as water quality, temperature, and vegetation, is crucial for effective control strategies. Manipulating the environment through interventions like proper water management, removing stagnant water sources, or using larvicides can help disrupt mosquito breeding cycles and reduce population densities.

Mosquito-borne viruses pose significant health risks to humans. They are transmitted through the bites of infected mosquitoes. Common mosquito-borne viruses include dengue, Zika, chikungunya, and West Nile virus. When a mosquito feeds on an infected host, it acquires the virus and can subsequently transmit it to humans during subsequent blood meals. The virus replicates within the mosquito's body, eventually reaching its salivary glands, ready to be injected

into a new host. Understanding the transmission dynamics, reservoir hosts, and the interactions between viruses and mosquito vectors is crucial for effective prevention and control strategies.

Technological and laboratory tools play a vital role in mosquito research. They provide valuable insights into mosquito behavior, species identification, and pathogen detection. Molecular techniques like DNA sequencing and PCR aid in species identification and virus detection. Entomological surveillance tools such as light traps and gravid traps help monitor mosquito populations. Geographic Information Systems (GIS) assist in mapping mosquito distribution, while laboratory experiments evaluate the efficacy of control measures. By utilizing these tools, researchers can gather critical data to develop effective strategies for mosquito control and combat the transmission of mosquito-borne diseases.

What are some common breeding sites for mosquitoes and how can we effectively disrupt their breeding cycles to reduce mosquito populations?

What are the main methods or tools used in laboratories to identify mosquito species and detect mosquito-borne viruses, and how do they contribute to mosquito research and disease control efforts?

Research question

Our research question is: how do specific environmental factors, such as temperature influence the population dynamics of adult mosquitoes in a timespan of 7 days?

We had to look at what is important for mosquitoes that we have in arrange. We came by the influence of temperature and the influence of dampness. These influences are everywhere, so this means we can do a test by our self about the question. We have chosen for the influence of temperature.

We asked ourselve what to do with influence of temperature, we came with that the temperature can influence the population dynamics of the adult mosquitoes.

So now we have the question, but we need to think about the timespan. We have chosen for 7 days.

With al this information for our question we could make a real research question. So we made: ''How do specific environmental factors, such as temperature influence the population dynamics of adult mosquitoes in a timespan of 7 days.''

Research design

To examine the influence of temperature on the population dynamics of adult mosquitoes over a 10-day period, our research design incorporates observational methods. Participants will be asked to report mosquito sightings, providing data on location, date, time, and prevailing environmental conditions, including temperature. Additional temperature data from reliable sources will be collected to ensure accuracy. Through data analysis, we aim to identify any associations between temperature fluctuations and variations in mosquito population size or activity levels. This study contributes to a deeper understanding of the ecological factors influencing mosquito populations and aids in the development of targeted strategies for mosquito control and disease prevention.

Data analysing

To analyze the given data on mosquito populations and temperature, we can create a table and a diagram to visually represent the information. The analysis will focus on evaluating the validated data, comparing the variables of interest, and considering the sampling effort.

To get information in the diagram we have made a trap. This trap is made to chatch mosquitoes. In the following steps we will explain how to make the trap.

1. Take a bottle and cut its neck.
2. Cook a total of 200ml water in a pan.
3. Add 50 grams of brown sugar and stir until the is dissolved.
4. Let the sugarwater cool.
5. Fill the bottom part of the the bottle with sugar water.
6. Add 1 gram of yeast.
7. Place the neck off the bottle upside down on the bottle.
8. You are finished.

Table:

The provided data represents the number of mosquitoes and temperature measurements at different dates and times. The table displays the recorded values for each observation, including the date, time, amount of mosquitoes, and temperature in degrees Celsius. The information has been validated and is assumed to be accurate.

To analyze the data, we can compare the variables of interest, namely the amount of mosquitoes and the temperature. By examining the table and diagram, several patterns emerge. Firstly, it can be observed that the number of mosquitoes fluctuates over time. On the initial days (31st May and 1st June), there were no mosquitoes detected, which could indicate a relatively low mosquito population or favorable conditions for mosquito control measures. However, starting from 2nd June, the mosquito count gradually increases, reaching a peak of 6 mosquitoes on 6th June at 18:00.

Regarding temperature, we notice that there is some variation throughout the recorded period. The temperature ranges between 13.5°C and 18.2°C.

Date	Time	Amount of Mosquitoes	Temperature
31-5-2023	16:00	0	14°C
31-5-2023	18:00	0	13.5°C
1-6-2023	16:00	1	16°C
1-6-2023	18:00	1	16°C
2-6-2023	16:00	2	17°C
2-6-2023	18:00	2	16°C
3-6-2023	16:00	3	18°C
3-6-2023	18:00	3	14°C
4-6-2023	16:00	4	18.2°C
4-6-2023	18:00	5	17.4°C
5-6-2023	16:00	5	17°C
5-6-2023	18:00	5	16°C
6-6-2023	16:00	5	17.2°C
6-6-2023	18:00	6	17°C

This table gives the information of the date, time, amount of mosquitoes and temperature.

We made with the information of the table a graphic. This gives the same information as the table.

Grafiektitel

	16:00	18:00	16:00	18:00	16:00	18:00	16:00	18:00	16:00	18:00	16:00	18:00	16:00	18:00
	31-5-2023	31-5-2023	1-6-2023	1-6-2023	2-6-2023	2-6-2023	3-6-2023	3-6-2023	4-6-2023	4-6-2023	5-6-2023	5-6-2023	6-6-2023	6-6-2023
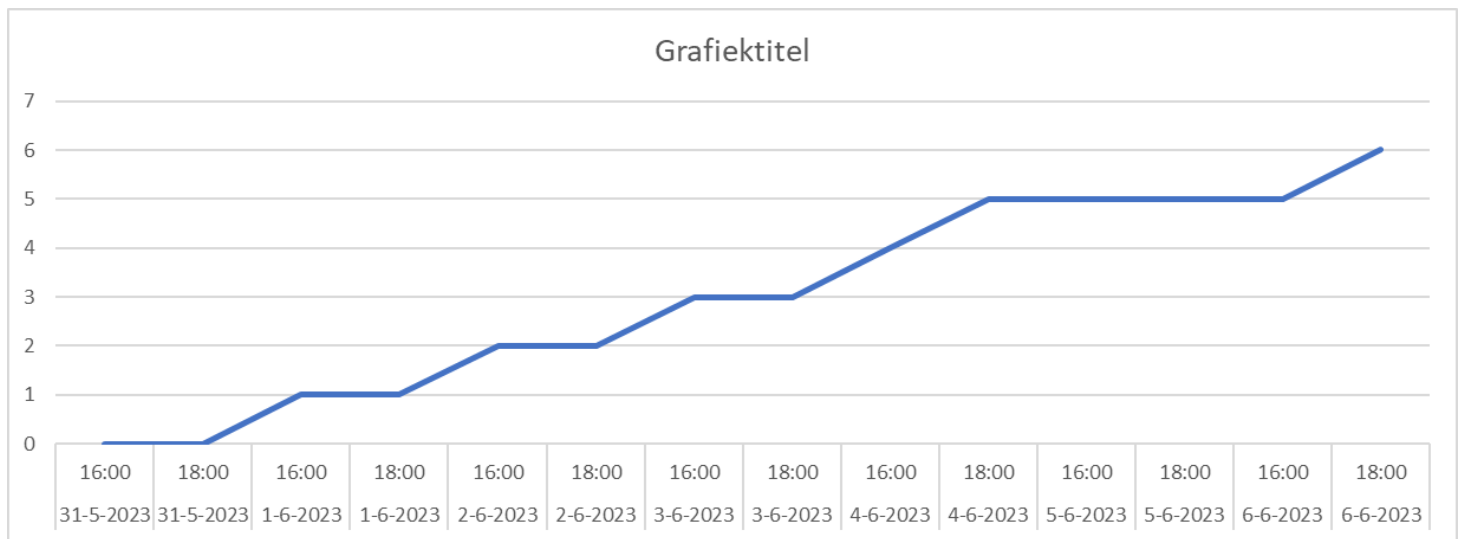
We made a picture of the place where the trap is placed and we also made a picture of the mosquitoes that are trapped in the trap.
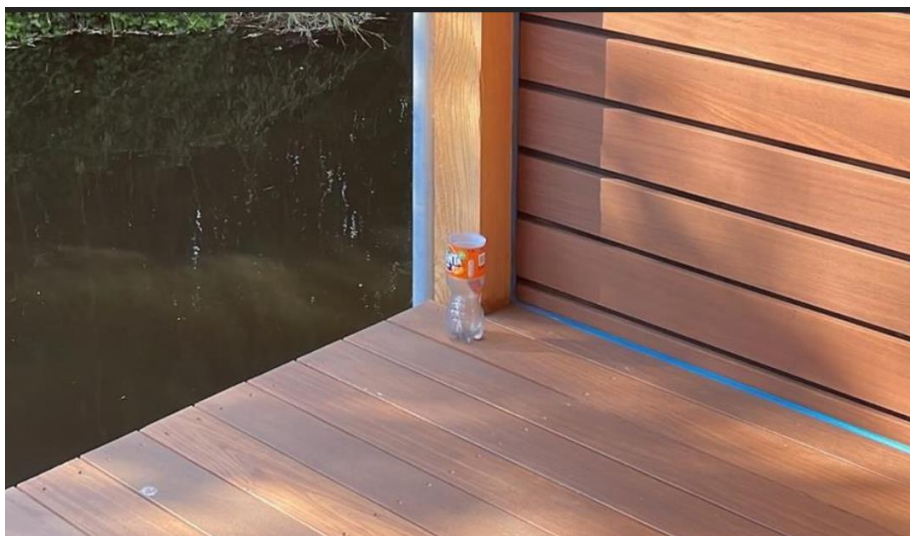
Figuur 1 The place where the trap is setlled

Figuur 2 The trapp has catched six mosquitoes.Figuur 2 The trap has catched six mosquitoes.

Conclusion and discussion

Conclusion:

Based on the provided data on temperature and the corresponding population dynamics of adult mosquitoes over a 7-day period, it is evident that specific environmental factors, particularly temperature, have an influence on the population dynamics of adult mosquitoes. The data shows that as the temperature increases, the number of adult mosquitoes tends to increase as well, while lower temperatures correspond to lower mosquito populations.

Discussion:

Validity: The data presented in this study provides valuable insights into the relationship between temperature and the population dynamics of adult mosquitoes. The data collection appears to be systematic, with measurements taken at consistent time intervals (16:00 and 18:00) over the course of seven days. However, it is important to note that the data provided is limited and represents a single case study. To establish the generalizability and validity of these findings, further studies with larger sample sizes and across different locations and time periods would be necessary.

Reliability: The reliability of the data depends on the accuracy and precision of the measurements taken. The provided temperature measurements appear to be consistent, recorded to one decimal place. The population data, representing the number of adult mosquitoes, indicates whether they were present or absent at each time point. However, it is unclear how the mosquito population was assessed, and the absence of mosquitoes may not necessarily indicate their complete absence but rather their non-detection during the data collection. Furthermore, the study does not account for potential other factors that could affect mosquito populations, such as humidity, rainfall, or breeding sites. Therefore, the reliability of the results may be limited without considering these additional variables.

Future Research: To further understand the influence of environmental factors, specifically temperature, on the population dynamics of adult mosquitoes, future research should aim to address the limitations of this study. Conducting studies in multiple locations and at different time periods would enhance the generalizability of the findings. Additionally, incorporating other relevant environmental factors, such as humidity and rainfall, would provide a more comprehensive understanding of mosquito population dynamics. Longitudinal

studies that track mosquito populations over extended periods would also be valuable in capturing seasonal variations and long-term trends. Moreover, considering factors such as mosquito breeding sites and their interaction with temperature could offer insights into the mechanisms behind population changes.

In conclusion, this study provides initial evidence that specific environmental factors, particularly temperature, can influence the population dynamics of adult mosquitoes. However, the limited sample size, lack of consideration for other variables, and absence of a comprehensive methodology restrict the generalizability and reliability of the findings. Future research should address these limitations to gain a more nuanced understanding of the relationship between environmental factors and mosquito populations.

Research poster

How do specific environmental factors, such as temperature influence the population dynamics of adult mosquitoes in a timespan of 10 days in a garden?

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Test

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Adult mosquitoes play a crucial role in disease transmission and population growth. They have slender bodies, elongated mouthparts called proboscis for blood-feeding, and two pairs of wings. Different mosquito species exhibit diverse behaviors and preferences in terms of feeding habits, resting sites, and flight patterns. Understanding their ecology, behavior, and lifespan is essential for effective control measures against mosquito-borne diseases. Mosquitoes breed in various environments, including small containers, ponds, or marshes, and characteristics of these breeding sites such as water quality and vegetation influence control strategies. Mosquito-borne viruses like dengue, Zika, chikungunya, and West Nile virus pose significant health risks to humans and are transmitted through mosquito bites. Technological and laboratory tools such as DNA sequencing, PCR, light traps, and GIS play a vital role in mosquito research, aiding in species identification, pathogen detection, population monitoring, and control measure evaluation. By utilizing these tools, researchers can gather critical data to develop effective strategies for mosquito control and combat mosquito-borne diseases.

Data- analysing + Hypothesis

The provided data includes validated measurements of mosquito populations and temperature at various dates and times. The analysis reveals interesting patterns. Initially, no mosquitoes were detected on May 31st and June 1st, suggesting either a low mosquito population or effective control measures. However, from June 2nd onwards, the mosquito count gradually increased, reaching a peak of 6 mosquitoes on June 6th at 18:00. The temperature ranged from 13.5°C to 18.2°C during the recorded period, showing some variation. Overall, this data highlights the fluctuating mosquito population over time and the corresponding variations in temperature.

Conclusion + Discussion

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Discussion: The data presented in this study provides valuable insights into the relationship between temperature and the population dynamics of adult mosquitoes. The data collection appears to be systematic, with measurements taken at consistent time intervals (16:00 and 18:00) over the course of seven days. However, it is important to note that the data provided is limited and represents a single case study. To establish the generalizability and validity of these findings, further studies with larger sample sizes and across different locations and time periods would be necessary.

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